

The Economics of Tobacco Farming in Indonesia:

3rd Wave Tobacco Farmers Survey

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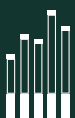
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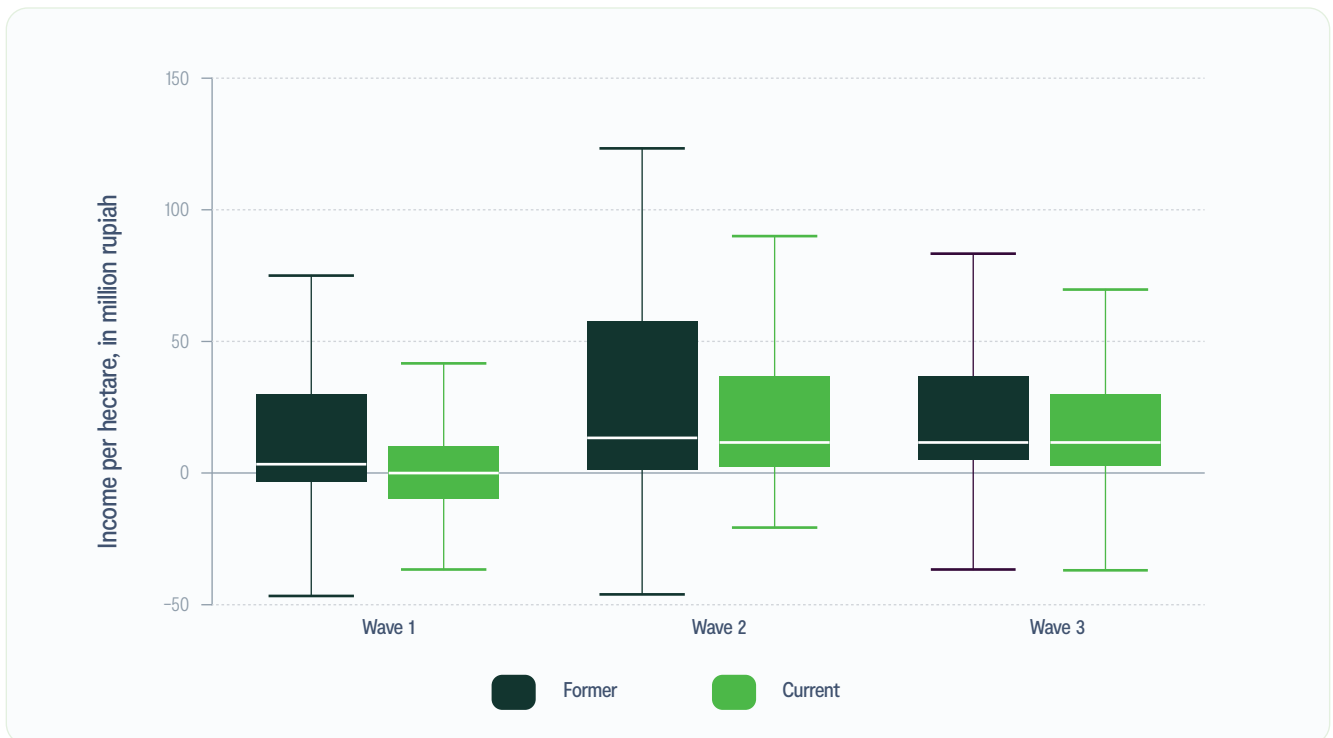
Executive Summary

There have been efforts to develop and implement progressive tobacco control policies—such as high tobacco excise tax rates—to reduce the burden of tobacco use on human health. Opponents of such policies, in particular the tobacco industry, consistently put forth the argument that these policies will have adverse effects on the livelihoods of tobacco sector workers, particularly tobacco farmers. Existing studies in different country settings provide robust evidence against this simplistic narrative. These studies show that tobacco farming households typically generate small profits and even losses and struggle with dramatic income fluctuations from year to year. Most of these studies provide a single point in time snapshot of the economic livelihoods of tobacco farming households. To obtain a more comprehensive understanding of their livelihoods, we need to further

investigate the dynamics of tobacco and non-tobacco farming across time.

This study tracks the same representative group of current and former tobacco farming households in Central and East Java, Indonesia, over four years and compares the median house hold income for both groups over time. The three survey waves coincided with an overall poor farming year (Wave 1) and two overall stronger years for farming (Wave 2 and Wave 3), with weather as one of the main variables affecting farmers’ production. This study collects data using a comprehensive household survey with both current and former tobacco farmers. The results of this study provide further evidence against the simplistic tobacco industry narrative and important insights into the economic context of tobacco farming.

Figure ES-1. Median Total Household Income per Hectare of Tobacco and Non-tobacco Farmers Across Waves



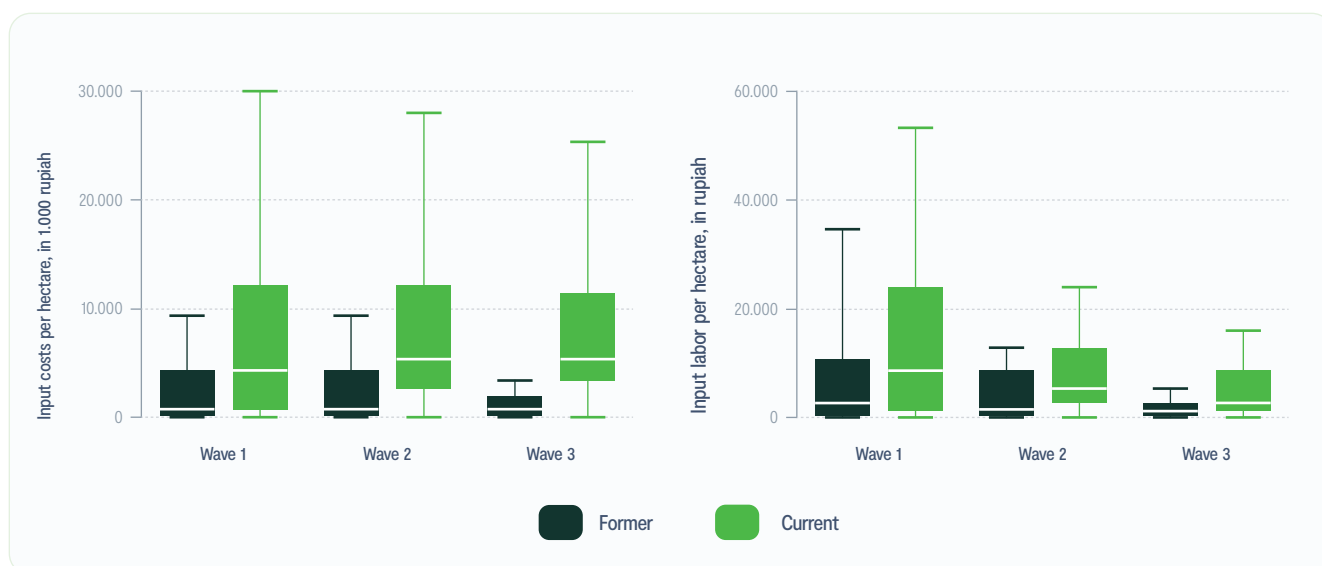
Notes: The sample includes tobacco and former tobacco farmers in Central and East Java. Non-tobacco crops profit is defined as crop sales minus inputs and costs of hired labor. Non-tobacco crops income is defined as crop sales minus inputs, costs of hired labor, and household labor costs. Tobacco income is defined as tobacco sales minus inputs, costs of hired labor, and household labor costs. For each wave and for each group of farmers, we drop observations with total household income lower than the 5th and higher than the 95th percentiles. Total household income is defined as agricultural sales plus wage income, non-farming income, and other income minus input costs, rent, costs of hired labor, and household labor costs. The second and third wave incomes are adjusted for inflation.

We show median household income per hectare for both tobacco and non-tobacco farming households in Figure ES-1. We learn that tobacco and non-tobacco crops performed quite well and generated positive income in a favorable growing season. Positive income from tobacco farming in a good year is one of the reasons why many tobacco farmers in our study stated that tobacco farming is a lucrative activity. However, we can also observe that non-tobacco farming performed much more consistently over time—there was a far smaller difference between a “good” and “bad” year. One of the underlying reasons is that non-tobacco farming

households do not rely heavily on agricultural income. They also rely on farming and non-farming enterprises, wage income, as well as other income sources.

Tobacco farming households incur higher costs for both agricultural inputs and labor compared to non-tobacco crops. Tobacco farming households consistently incurred significantly larger agricultural costs per hectare across all waves (Panel A of Figure ES-2). The costs of hired labor per hectare again were consistently higher for tobacco farmers than non-tobacco farmers and were greater for tobacco farmers in a bad year (Wave 1) than in better farming years (Panel B of Figure ES-2).

Figure ES-2. Costs per hectare of tobacco and non-tobacco farmers across waves



The evidence from this exhaustive survey research demonstrates that tobacco farmers would be economically better off by shifting to non-tobacco crops. The main findings of this report include:

1. Both tobacco and non-tobacco farmers have income portfolio from agriculture, enterprise, wage, and other income. Tobacco farming households typically rely more heavily on agricultural income. In contrast, a higher share of former tobacco farmers relies on enterprise income, wage income, and other sources of income.
2. Tobacco farming typically provides only a small contribution to a typical farmer’s household

revenue. More than 85 percent of tobacco farmers were deriving less than half of their revenue from tobacco growing in the weak agricultural production year in Wave 1. Even in the better years of Wave 2 and Wave 3, there were still 70 and 79 percent of tobacco farmers respectively who derived less than half of their revenue from tobacco growing.

3. A typical non-tobacco farmer generated higher income than a typical current tobacco farmer. The more stable and higher household income of former tobacco farmers can be explained, among others, by the diverse income portfolio, particularly non-agricultural wages and other income.

4. A typical tobacco farmer in the poor farming year (Wave 1) did not experience positive total household income per hectare. Only in good years of Wave 2 and 3, a typical tobacco farmer generated positive total household income per hectare. On the other hand, despite the changing agricultural conditions across waves, a typical former tobacco farmer consistently generated positive income.
5. Higher tobacco farming income in Wave 2 and Wave 3 compared to Wave 1 is largely explained by volatility in prices and volume of tobacco leaf sold. Median prices in Wave 3 were lower by about 24 percent than median prices in Wave 2, but they were only lower by 8.8 percent than median prices in Wave 1. Median prices in Wave 3 were lower mainly for Virginia and Burley leaf types.
6. Poverty rates among tobacco farmers are significantly higher than the nationwide poverty rate. The estimated poverty rates among tobacco farmers were lower in the good farming years (Wave 2 and 3) than in the poorer farming year in Wave 1. A significant share of tobacco and former tobacco farmers obtained social assistance in various forms, which places an added burden on the government.
7. Differences in input costs per hectare borne by current and former tobacco farmers were quite large. In Wave 3, tobacco farmers spent about Rp6 million per hectare for tobacco crops, while former tobacco farmers spent less than one million rupiah for non-tobacco crops. This pattern is remarkably consistent across years. About a quarter of tobacco farmers reported needing loans for tobacco farming inputs partly due to these high input costs.
8. Tobacco farming is a much more labor-intensive endeavor than non-tobacco farming. In Wave 3, a typical (i.e., median) tobacco farming household spent 1,363 hours per hectare for tobacco farming but spent only 197 hours per hectare for non-tobacco farming. This suggests that tobacco farming households bear significantly larger household labor costs. Note that tobacco farmers in general do not include household labor costs in the calculation of income and therefore tend to overestimate their income from tobacco farming.
9. A typical tobacco farming household also spent more resources for hiring labor for their tobacco farming than a typical former tobacco farming household spent for non-tobacco farming due to the many hours of labor needed for tobacco.
10. One of the consequences of large labor demands and the poor returns is child labor as evident in our data. Child labor—both and male and female—was particularly harvest and post-harvest.
11. In the survey, tobacco farmers shared their reasons for their willingness to shift from tobacco farming. Consistently across waves, low leaf price is the main cited reason for their willingness to shift from tobacco. In Wave 3, about 15 percent of tobacco farmers mentioned an inability to sell their crop as one of the main reasons. Importantly, a third of tobacco farmers—higher than the share in Wave 1 and Wave 2—mentioned that having more attractive alternatives is a reason for shifting, suggesting an important potential for intervention.

Recommendations

1. The government must **establish agricultural extension services to educate farmers on different cash crops suitable for local conditions.** The extension services should also introduce farmers to more advanced farming technology that would allow farmers to produce quality cash crops.
2. The agricultural extension service should also provide market insights for farmers. The extension services can provide **information on crops that are in demand in local and adjacent markets.** The extension service can also provide information on **prices** of different crops. This information will help farmers to better decide **crop portfolio** in each season.
3. The government must identify and develop a **reliable and adequate source of water and concomitant irrigation systems** for non-tobacco farming in the dry season. Since the start of Joko Widodo's presidency, the government has been building water reservoirs. The government should continue to build strategic reservoirs or deep groundwater wells in tobacco regions and ensure a reliable supply of water during the dry season to support and encourage non-tobacco farming.
4. **The government must incentivize the establishment of farmer groups.** The government can also provide start-up funds through available program such as the Village Fund program. Farmer groups facilitate knowledge sharing among member farmers. Member farmers can also pool resources to sell crops directly to market, eliminating middlemen in the process. Member farmers can also pool resources to obtain essential agricultural inputs at better prices, particularly fertilizers.
5. The government can allocate resources, e.g., from regional funds or village funds, to help farmer groups to **develop value chains for common crops.** For example, the government can train farmer groups to create micro business to package and label their crops before distributing them to local markets; to process common crops to higher-value goods.
6. **The government can establish financial and non-financial incentives that are tied to non-tobacco crops growing.** An alternative is for the government to initiate a credit program specifically to fund non-tobacco crops. Another alternative is to provide subsidized inputs conditional on the farmer's crop portfolio.



The Economics of Tobacco Farming in Indonesia:
3rd Wave Tobacco Farmers Survey

Part 1

Introductions

5 - 7



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1. Introductions

Tobacco control policies play a crucial role in lessening the burden of tobacco use on human health. The development and implementation of progressive tobacco control policies—such as high tobacco excise tax rates—continues to face resistance. Those who oppose such policies—specifically the tobacco industry and its allies—often argue that they will have adverse effects on the macroeconomics of the country and particularly on the economic livelihoods of workers in the tobacco sector including tobacco farmers (Otañez, Mamudu, and Glantz 2009; Lencucha, Drope, and Labonte 2016).

Existing studies provide robust evidence against this simplistic narrative. Studies that analyze the economics of smallholder tobacco farming show that farming households generate only small profits and even losses (Drope, Schluger, et al. 2018; Goma et al. 2017; Magati et al. 2016; Chavez et al. 2016; Makoka et al. 2017). A two-wave study of tobacco farmers in Indonesia show that profits gained in a good year were much lower than losses incurred during the bad year, leading to net losses over time (Sahadewo, Drope, Kartaadipoetra, et al. 2020). Another study of tobacco farmers in Indonesia shows that tobacco farming has negative effects on household income (Sahadewo, Drope, Li, Nargis, et al. 2020).

Like in other tobacco-growing countries, the narrative on the adverse effects of a progressive tobacco control policy is well developed and entrenched in Indonesia, despite the fact that tobacco farming contributes very little to GDP at only 0.03 percent (Rachmat 2010). In 2018, the share of tobacco farmers to total farmers in the Indonesian agricultural sector and to total employment was only 1.6 percent and 0.7 percent, respectively (Sahadewo et al. 2018). Tobacco growing is concentrated regionally in three provinces: East Java (42.9 percent), Central Java (24.1 percent), and Nusa Tenggara Barat (23 percent) (Directorate General of Estate Crops 2021).

This report is primarily based on a third wave of data that builds on two previous waves of the Tobacco Farmer Survey (TFS) in 2016 and 2017–2018.

We established a tracking protocol to re-interview 660 tobacco and former tobacco farmers from Wave 2. This sample is representative of tobacco farmers in East and Central Java. We successfully re-interviewed 656 current and former tobacco farmers for the Wave 3 TFS in 2019–2020. In addition, we introduced four new sections in the survey on risk preference, general satisfaction, a vignette-based inquiry on subjective welfare, and intra-household decision making. The additional sections allow us to investigate emerging questions related to tobacco farming.

We find that tobacco and former tobacco farmers appear to have enjoyed another relatively strong farming year in the Wave 3 TFS. On average, current and former tobacco farmers gained positive income in Wave 3. Former tobacco farmers not only made positive agricultural income, but also gained higher profits from enterprise income, agricultural and non-agricultural wage income, and other income. One of our key findings is that a lower share of land allocated for tobacco farming has a positive effect on household income. The more diverse economic portfolio of former tobacco farmers is one of the reasons why this group consistently gained positive income even during the comparatively weak farming year of 2016.

Desirable tobacco farming outcomes were driven by higher volumes of tobacco leaf sold, which increased by about 26.5 percent in Wave 3 compared to Wave 2. Tobacco prices in Wave 3 were more favorable compared to Wave 1 prices but were still lower than Wave 2 prices by 24 percent. Despite higher volumes of tobacco leaf sold, sales revenues decreased in Wave 3 by about 19 percent. As in Wave 2, tobacco farming was generally profitable in Wave 3. Despite two successful years, it is important to note that tobacco profits from Wave 2 and Wave 3 combined were still lower than tobacco losses in Wave 1.

It is also important to note that tobacco farmers bore significantly higher agricultural and labor inputs per hectare than former tobacco farmers. Tobacco farming in general required more inputs than

non-tobacco farming. Tobacco farmers borne higher costs for household and hired labor because tobacco farming is a more labor-intensive activity. We also find evidence that child labor in tobacco farming persisted in Wave 3.

This report delves into the various conditions under which tobacco is grown and analyzes the ways that these conditions shape economic outcomes for farming households. The findings add important insights into the nature of tobacco growing in Indonesia, with an aim of providing a more accurate assessment of the costs and benefits of production over time. We structure the report as follow. Section 2 discusses the research methods including sampling, survey instruments, computer-assisted personal

interviewing, sample selection, and data analysis. Section 3 presents analyses on sociodemographic characteristics of tobacco and former tobacco farmers. Section 4 discusses the economics of tobacco farming including contracts, costs, volume of leaf sold, prices, and profits. Section 4 also discusses other crop growing and reasons why farmers continue to grow tobacco. Section 5 discusses the incidence of child labor in tobacco farming. Section 6 discusses asset accumulation, food security, farming satisfaction, and risk preference. We state our conclusions in Section 7.



The Economics of Tobacco Farming in Indonesia:
3rd Wave Tobacco Farmers Survey

Part 2

Methodology

8 - 11



2. Methodology

2.1. Sampling

The first wave of the Tobacco Farmer Survey (TFS) was launched in 2016. The Wave 1 TFS was a representative survey of tobacco and former tobacco farmers in Indonesia. The survey was fielded between October and December 2016. For the Wave 1 TFS, we purposively select East Java, Central Java, and Nusa Tenggara Barat (NTB). These regions are the top three main tobacco producing regions in Indonesia, accounting for about 90% of total tobacco production in Indonesia (Sahadewo et al. 2018). We purposively select the two-top producing kabupaten (districts) within each province. They are Magelang and Temanggung in Central Java Province; Jember, and Bojonegoro in East Java Province; and Lombok Tengah and Lombok Timur in West Nusa Tenggara. Tobacco farmers in these districts mainly farm Virginia or Oriental variety. Therefore, we added the district of

Lumajang in East Java to obtain a sample of farmers who plant Burley tobacco.

We then randomly select a top producing kecamatan (sub-district) and a second tier producing sub-district. We stratify the selection of the sub-district by the types of tobacco produced. In each selected sub-district, we select the top 3 villages. There was a total of 18 villages in the Wave 1 TFS. In each selected village, we selected a sub-village and through the village head, listed at least 40 tobacco farmers and 10 former tobacco farmers. We then randomly selected 20 tobacco farmers and 5 former tobacco farmers. The final sample of the Wave 1 TFS included 1,350 tobacco and former tobacco farmers. In Table 2.1, we summarize the number of respondents in each sub-district for the Wave 1 TFS.

Table 2-1. Survey Respondents, by Province, District, and Sub-District

Province	District	Sub-District	Wave 1	Wave 2	Wave 3
East Java	Bojonegoro	Kepoh Baru	75	45	45
		Ngasem	75	45	45
		Ngraho	75	45	45
		Tambakrejo	75	45	45
	Jember	Balung	75	45	45
		Kalisat	75	45	45
		Pakusari	75	45	45
		Puger	75	45	44
	Lumajang	Pasirian	75	55	54
		Tempeh	75	65	64
Central Java	Temanggung	Bulu	75	45	45
		Parakan	75	45	44
	Magelang	Kaliangkrik	75	45	45
		Windusari	75	45	45
West Nusa Tenggara	Lombok Tengah	Janapria	75	-	-
		Praya Timur	75	-	-
Total			1,350	660	656

We conducted the Wave 2 TFS between December 2017 and January 2018. We revisited the Wave 1 villages in Central and East Java only owing to budget constraints. We revisited villages in Central and East Java to obtain a sample that is still representative of most tobacco farmers in Indonesia. For the Wave 2 TFS, we randomly selected 15 out of 25 Wave 1 households in each sub-village. The sampling protocol maintained the ratio of 4:1 between Wave 1 tobacco and former tobacco farmers. We maintained the 1:1 ratio of tobacco and former tobacco farmers in the district of Lumajang to ensure representativeness of the Wave 1 sample. We obtained a total of 660 tobacco and former tobacco farmers for the Wave 2 TFS. We discuss in detail the fieldwork protocol to

randomly select the Wave 2 respondents in the Wave 2 TFS report (Sahadewo, Drope, Kartaadipoetra, et al. 2020). In the report, we also discuss the replacement rule for households who could not be re-interviewed for various reasons.

We revisited the 660 Wave 2 TFS households for the Wave 3 TFS between December 2019 and January 2020. We were able to re-interview 656 out of 660 tobacco and former tobacco farmers for the Wave 3 TFS. We were not able to re-interview or complete the interview of the 4 remaining households owing to circumstances beyond the control of the team.

2.2. Survey Instruments

We built on the Wave 1 and Wave 2 instruments for the Wave 3 TFS instruments. The instruments were initially developed with significant data collection elements from the World Bank's Living Standards Measurement Study (LSMS). In addition, the instruments were also developed based on insights and knowledge from recent studies on the political economy of tobacco farming in Sub-Saharan Africa, Philippines, and Indonesia (Chavez et al. 2016; Goma et al. 2017; Magati et al. 2016; Makoka et al. 2017; Drope, Li, et al. 2018).

We modified the Wave 2 instruments to better measure several variables and to add variables to inform emerging questions about switching to alternative crops and livelihoods including off-farm opportunities. The Wave 3 instruments consists of 31 sections and includes the following major topics: household characteristics; employment; non-farm business, planting and land use in the tobacco (dry season) and non-tobacco (wet season) seasons; agricultural inputs; tobacco and crop sales; contract farmin; tobacco marketing; assets; farmer debt and loans; household food security; access to financial services; perception regarding current tobacco yield and sales revenues; health; and future expectations.

The Wave 3 instrument includes five new sections: smoking participation, risk preference, general satisfaction, vignette on subjective welfare, and intra-household decision making. The smoking participation section includes two questions to capture smoking participation of all household members. The risk preference section includes a set of hypothetical situations to measure risk preference. For example, in the survey, respondents are presented with two options to get income from planting crops. The first option offers a guaranteed income of Rp1 million, while the second option offers an income of Rp2 million or Rp1 million with the same likelihood. Respondents are asked to choose between one of the two options. The set of hypothetical situations have been used in several previous surveys in Indonesia including the Indonesia Family Life Survey (Strauss, et al 20015).

The general satisfaction section includes subjective well-being questions including life satisfaction, happiness, and other measures of subjective well-being that have been widely used in household surveys around the world (Kahneman and Krueger 2006). There is a section that includes vignettes on subjective welfare that can help compare

subjective well-being across individuals with different subjective thresholds (King et al. 2004). Lastly, we added a section on intra-household decision making

2.3. Computer-Assisted Personal Interviewing

There has been a shift towards the use of computers in data-collection modes in recent years (Smith and Kim 2015). We designed the Wave 1 to Wave 3 TFS for a computer-assisted personal interviewing (CAPI) mode using a CPro-based program developed by our survey implementing partner. The implementation of CAPI for the TFS offers several advantages. First, the CAPI mode allows us to design a complex survey as there are a significant

to identify individuals who make decisions regarding expenditure and resource allocation in the household.

number of sections and questions in the TFS. The complex survey design includes missing data checks, consistency checks, and data recapitulation. Second, the CAPI mode allows us to integrate complete audio recording of the interview, which is useful for quality control such as backchecks. Third, the CAPI mode allows us to integrate interview data from the Wave 1 to the Wave 3 TFS. Lastly, the CAPI mode allows us to design a secure data backup protocol.

2.4. Sample Selection

There are two ways of selecting the sample for analysis given the design of the sampling for the Wave 2 and Wave 3 TFS. The first option is to include a panel of households observed in Wave 1, Wave 2, and Wave 3 TFS. The second option is to select all tobacco and former tobacco farmers in Central and East Java observed in Wave 1, Wave 2, and Wave 3 TFS. We excluded respondents from NTB observed only in Wave 1 TFS for comparability of statistics across waves. Both options produce a representative sample of tobacco farming population in Indonesia, particularly Java.

In the Wave 2 TFS report, we discuss in detail the methodology that we use to determine which

sample selection to use (Sahadewo, Drope, Kartaadipoetra, et al. 2020). Specifically, we use a logistic regression to identify whether the likelihood of being revisited in the Wave 2 TFS is correlated with respondents' characteristics in the Wave 1 TFS. We find no systematic differences in the Wave 1 characteristics between respondents who were revisited in the Wave 2 TFS and those who were not. Given this finding, we use all observations from the Wave 1 and Wave 2 TFS—excluding observations from NTB—for analyses of the Wave 2 TFS. We use the same sample selection method for the Wave 3 TFS because we revisited the same set of households observed in the Wave 2 TFS.

2.5. Data Analyses

We use two broad analytical tools to conduct data analyses namely descriptive and multivariate regression analyses. The objectives of the descriptive analyses are to analyze farmers' sociodemographic characteristics, agricultural and non-agricultural outcomes, employment, household economic livelihoods, as well as their subjective well-being and perceptions. On the other hand, the objectives of

regression analyses are to identify correlations or associations between key variables of interest including the relationship between tobacco farming and income, correlates of tobacco-growing contract, and correlates of green-tobacco sickness. We use Stata version 15.1 (StataCorp LLC, College Station, Texas, USA) to conduct descriptive and regression analyses.

The Economics of Tobacco Farming in Indonesia:
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Part 3

Farmer's Characteristics

12 - 27



3. Farmer's Characteristics

3.1. Sociodemographic profile

We present the characteristics of tobacco and former tobacco farmers across waves of TFS in Table 3.1. The overwhelming majority of current and former tobacco household heads are middle-aged men with at most elementary school education. Specifically, about 94.82 percent of household heads were male, and about 67.07 percent of household heads were between 36 and 60 years old. Almost three-quarters of tobacco and former tobacco farmers reported completing or obtaining some elementary school education. The relatively low level of educational attainment is a common feature of the Indonesian agricultural sector (Ministry of Agriculture 2018).

The main activity of the majority of current and former tobacco household heads is agricultural work. It is important to note that the share of household head undertaking agricultural work is lower in the Wave 3 TFS than in both the Wave 1 and Wave 2 TFS. The shift towards non-agricultural work is higher among former tobacco households than among tobacco growing households. It is also important to note that tobacco household heads rely more on agricultural work, while there is a larger share of former tobacco household heads who rely on non-agricultural work.

Table 3-1. Characteristics of Former and Current Tobacco Farming Household Head

	Wave 1			Wave 2			Wave 3		
	Current	Former	Total	Current	Former	Total	Current	Former	Total
Gender, in %									
Female	2.89	2.75	2.86	2.73	7.43	3.79	4.31	7.74	5.18
Male	97.11	97.25	97.14	97.3	92.6	96.2	95.69	92.26	94.82
Age (Years), in %									
21-35	11.07	11.37	11.14	8.59	8.11	8.48	6.78	6.55	6.71
36-60	72.08	69.80	71.52	68.95	68.24	68.79	66.53	68.45	67.07
>60	16.86	18.82	17.33	22.5	23.7	22.7	26.69	25	26.22
Marital Status, in %									
Never married	1.01	1.96	1.24	0.20	0.68	0.30	0.21	1.19	0.46
Married	93.84	94.12	93.90	94.34	93.92	94.24	94.25	88.69	92.84
Divorced/ separated	1.13	0.39	0.95	0.59	1.35	0.76	0.21	1.19	0.46
Widowed	4.03	3.53	3.90	4.88	4.05	4.70	5.34	8.93	6.25
Education, in %									
Some SD	39.37	32.16	37.62	43.55	35.81	41.82	40.86	40.48	40.85
SD	39.50	38.43	39.24	33.59	36.49	34.24	35.32	29.17	33.69
Some SMP	2.77	2.75	2.76	4.10	2.70	3.79	2.46	5.36	3.20
SMP	10.06	16.08	11.52	8.98	14.19	10.15	11.09	13.69	11.74
Some SMA	1.01	0.78	0.95	1.95	2.03	1.97	2.67	0.60	2.13
SMA	4.40	5.10	4.57	4.49	4.05	4.39	4.72	6.55	5.18
Some SMK	0.38	-	0.29	0.59	0.68	0.61	-	1.19	0.30
SMK	2.01	2.35	2.10	1.37	2.03	1.52	1.85	1.19	1.68
D1/D2/D3	-	-	-	-	-	-	-	-	-
Some College	-	0.39	0.10	0.39	-	0.30	0.41	-	0.30
College	0.50	1.96	0.86	0.98	2.03	1.21	0.62	1.79	0.91

	Wave 1			Wave 2			Wave 3		
	Current	Former	Total	Current	Former	Total	Current	Former	Total
Main Activity, in %									
Agricultural work	83.90	71.37	80.86	84.18	75.68	82.27	81.72	64.29	77.29
Non-agricultural work	13.58	22.35	15.71	12.70	22.30	14.85	15.81	27.98	18.90
Home duties	0.13	0.78	0.29	0.59	1.35	0.76	1.03	2.98	1.52
Retired/aged	1.26	1.57	1.33	1.37	0.68	1.21	0.62	1.79	0.91
Unemployed (looking for work)	0.25	1.57	0.57	0.39	-	0.30	0.21	-	0.15
No work	0.88	2.35	1.24	0.78	-	0.61	0.62	2.98	1.22
Observations	795	255	1,050	512	148	660	487	168	656

Note: The sample includes tobacco and former tobacco farmers in Central and East Java.

3.2. Economic Activities and Income

In the survey, we asked all household members the main source of livelihood in the past week and participation in tobacco farming in the past 12 months. We present the reported main source of livelihood among household members in Table 3.2. The majority of individuals in the farming household worked in their household's farm in the past seven days. The share is quite high because the survey was conducted during the harvest period.

We observe that the share was higher among individuals in tobacco farming households than in

former tobacco farming households. A portion of this difference can be explained by a higher share of individuals in the former tobacco farming households who were involved in any business activities. A large share of individuals in farming households did not receive a wage payment as income from farming activities are generally received by the household heads. It is important to note that the share of household members who received payment for their work was higher among former tobacco farming households than among current tobacco farming households.

Table 3-2. Main Source of Livelihood by Self-Report: All Household Members

	Tobacco Farmers		Former Tobacco Farmer	
	N	Proportion (%)	Current	Former
In the last 7 days				
Received payment in agricultural or non-agricultural activities	1,753	31.55	566	38.52
Business (fisheries, livestock)	1,753	28.47	566	32.51
Helped without paid in any kind	1,753	52.20	566	44.35
Worked on this household's farm	1,753	71.93	566	59.01
In the last 12 months				
Participated in tobacco farming	1,261	96.11	334	-
Participated in non-tobacco farming activities	1,261	91.36	334	98.80

Note: The sample includes only Wave 3 tobacco and former tobacco farmers in Central and East Java.

The TFS data allow us to calculate and analyze the revenue and income generated by current and former tobacco growing households across waves. As in the previous waves, we define household revenue as the sum of farming sales—both tobacco and non-tobacco—enterprise sale, wage, and other revenue. The concept of household revenue does not incorporate costs of farming and business activities. We define household income following the established literature that incorporates household labor costs (Chavez et al. 2016; Goma et al. 2017; Makoka et al. 2017). Total household income is the sum of tobacco farming profit—calculated by subtracting revenue with farming costs (including paid labor)—non-tobacco farming profit; household enterprise profit; wage income; and other income, minus rent and household labor costs (Drope, Li, et al. 2018; Sahadewo, Drope, Kartaadipoetra, et al. 2020).

Household labor cost is an important component in the calculation of household income. The concept provides an estimation of total opportunity costs of household labor. The concept will be useful to analyze whether opportunity costs of household labor differ between tobacco and former tobacco farming household. We used a specific

estimation method to calculate the household labor cost. The method has been used in the analysis of Wave 1 and Wave 2 TFS (Drope, Li, et al. 2018; Sahadewo, Drope, Kartaadipoetra, et al. 2020), and the method was developed based on methodologies in previous related studies (Chavez et al. 2016; Goma et al. 2017; Makoka et al. 2017). We calculate labor costs by multiplying the regional agricultural minimum hourly wages by the number of household labor hours reported. The calculated labor costs across waves are adjusted for annual inflation.

Given the aforementioned income variables, we calculate the percentages of tobacco and former tobacco farmers who generated income from various main sources. We report these percentages in Table 3.3. In all waves, almost all tobacco farmers generated agricultural income. In Wave 3 TFS, about 58.93 and 67.76 percent of tobacco farmers generated enterprise and wage income, respectively. On the other hand, in Wave 3, about 82.14 percent of former tobacco farmers generated agricultural income and about 70.24 percent of these farmers generated enterprise income. These statistics suggest that tobacco farmers relied heavily on agricultural income, while former tobacco farmers have a more diverse income portfolio.

Table 3-3. Percentage of Farmers Deriving Income from Main Sources

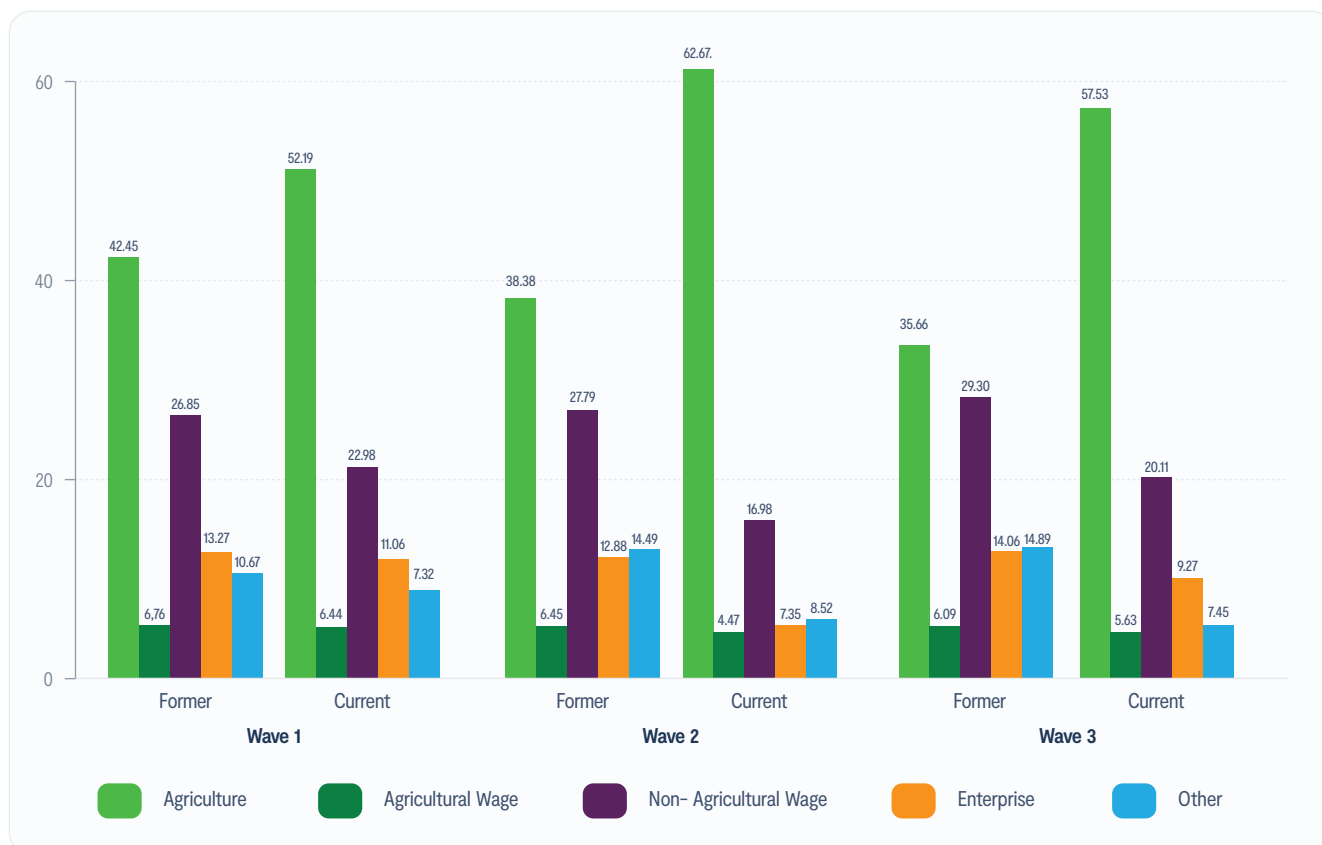
Wave	Current	Agriculture	Enterprise	Wage	Other
1	former	81.18	63.53	67.45	75.67
1	current	95.60	59.75	65.28	76.61
2	former	86.49	70.95	74.32	84.46
2	current	99.41	58.98	72.27	72.07
3	former	82.14	70.24	72.62	70.24
3	current	100.00	58.93	67.76	61.60

Note: The sample includes tobacco and former tobacco farmers in Central and East Java.

In Figure 3.1, we present the proportion of different revenue sources in household revenue. In Wave 3, the proportion of agricultural revenue among tobacco farmers was only 57.53. For a typical tobacco farmer, non-agricultural wage contributed significantly to household revenue. On the other hand, a typical former tobacco farmer generated a lower proportion

of agricultural revenue. Tobacco farmer's reliance on farming seems to be decreasing across years as well. More importantly, a typical former tobacco farmer had higher shares of revenue from the other sources. These statistics suggest that former tobacco farmers may rely on revenue sources other than agricultural revenue.

Figure 3-1. Proportion of Different Revenue Sources to Household Revenue



Note: The sample includes tobacco and former tobacco farmers in Central and East Java.

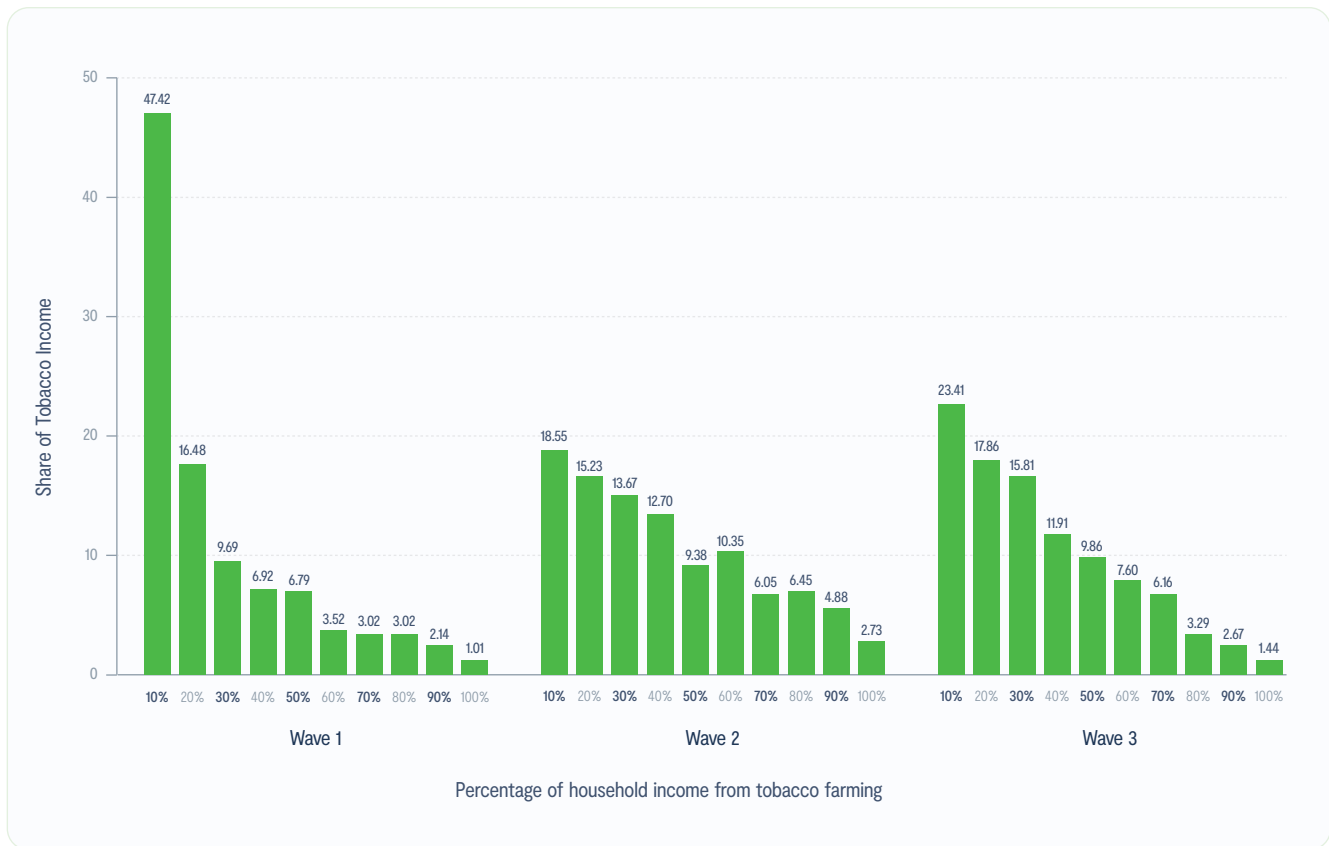
We now investigate the contribution of tobacco farming on household revenue by calculating the proportion of tobacco revenue to household total revenue for each household. We then categorize each household into one of the ten bins based on the proportion of tobacco revenue to total household revenue. A household in the first bin means that the proportion of tobacco revenue to total household revenue is below 10 percent, while a household in the second bin means that the proportion of tobacco revenue is between 11 and 20 percent. We depict the distribution of households based on tobacco revenue proportion in Figure 3.2.

The downward sloping figure in each wave suggests that there were more tobacco farmers who derive a small proportion of their revenue from tobacco farming. This suggests that in general tobacco farming has a small contribution to household revenue for a typical farmer. More interestingly, we can observe the dynamics of tobacco revenue share across waves. In Wave 1, more than 85 percent of tobacco farmers were deriving less than half of their revenue from tobacco growing. In contrast, there were 69.63 and 78.85 percent of farmers who derived less than half of their revenue from tobacco growing in Wave 2 and Wave 3, respectively. The main explanation of the

dynamic is that tobacco farming was significantly more profitable in Wave 2 and Wave 3 than in Wave 1. We

will discuss the dynamics of tobacco farming revenues in subsequent sections.

Figure 3-2. Proportion of tobacco Revenue to Household Revenue



Note: The sample includes tobacco and former tobacco farmers in Central and East Java.

We report dynamics of income from different sources experienced by current and former tobacco farmers across waves in Table 3.4. We explain definitions of various measures of income considered in the analysis in Box 3.1. In general, a typical current tobacco farmer was doing significantly better in Wave 2 and Wave 3 than in Wave 1 TFS. The average tobacco income was about Rp4.5 million in Waves 2

and 3, while the average tobacco income was negative in Wave 1. Interestingly, a typical former tobacco farmer was also doing significantly better in Waves 2 and 3 than in Wave 1 TFS. These statistics suggest that Wave 1 can be considered as a “bad” farming year, while Wave 2 and Wave 3 can be considered as “good” years.

Box 3.1. Definitions of Various Measures of Income

Non-tobacco crops profit is defined as crop sales minus inputs and costs of hired labor.

Non-tobacco crops income is defined as crop sales minus inputs, costs of hired labor, and household labor costs.

Agricultural income is defined as includes tobacco and non-tobacco farming incomes

Non-agricultural income is defined as income from enterprises, agricultural and non-agricultural wage, and other income.

Tobacco income is defined as tobacco sales minus inputs, costs of hired labor, and household labor costs.

Total household income is defined as agricultural sales plus wage income, non-farming income, and other income minus input costs, rent, costs of hired labor, and household labor costs.

Despite the dynamic across waves, a typical former tobacco farmer consistently generated higher household income than current tobacco farmers. Even in the “bad” farming year, the average former tobacco farmer generated Rp8.71 million while the average tobacco farmer only generated Rp1.79 million. The more stable household income of former tobacco farmers can be explained, among others, by the diverse income portfolio. While there is no stark difference in enterprise income and agricultural wage,

a typical former tobacco farmer earned higher non-agricultural wage and other income.

Summarizing, former tobacco farmers enjoyed a greater economic stability across the time of these survey waves. In contrast, income variation among tobacco farmers was higher. The variation is largely driven by tobacco income, particularly in the “bad” farming year.

Table 3-4. Average income from different sources, in 1,000 Indonesian rupiah

	Wave 1		Wave 2		Wave 3	
	Former	Current	Former	Current	Former	Current
Non-tobacco crops profit, wet season ²	1,663	2,142	1,311	2,967	2,271	2,142
Non-tobacco crops income, dry season ³	-847	-639	1,070	345	4,375	-639
Tobacco income ⁴	-	-5,074	-	4,577	-	-5,074
Enterprise income	547	570	1,159	735	571	570
Other income	1,332	813	2,648	1,759	3,648	813
Agricultural wage	956	1,051	1,251	1,213	2,153	1,051
Non-agricultural wage	5,789	5,004	5,927	5,336	9,285	5,004
Total HH income^{5,6}	8,714	1,791	12,542	13,952	20,230	16,137

Notes: The sample includes tobacco and former tobacco farmers in Central and East Java. Non-tobacco crops profit is defined as crop sales minus inputs and costs of hired labor.² Non-tobacco crops income is defined as crop sales minus inputs, costs of hired labor, and household labor costs.³ Tobacco income is defined as tobacco sales minus inputs, costs of hired labor, and household labor costs.⁴ For each wave and for each group of farmers, we drop observations with total household income lower than the 5th and higher than the 95th percentiles.⁵ Total household income is defined as agricultural sales plus wage income, non-farming income, and other income minus input costs, rent, costs of hired labor, and household labor costs. The second and third wave incomes are adjusted for inflation.⁶

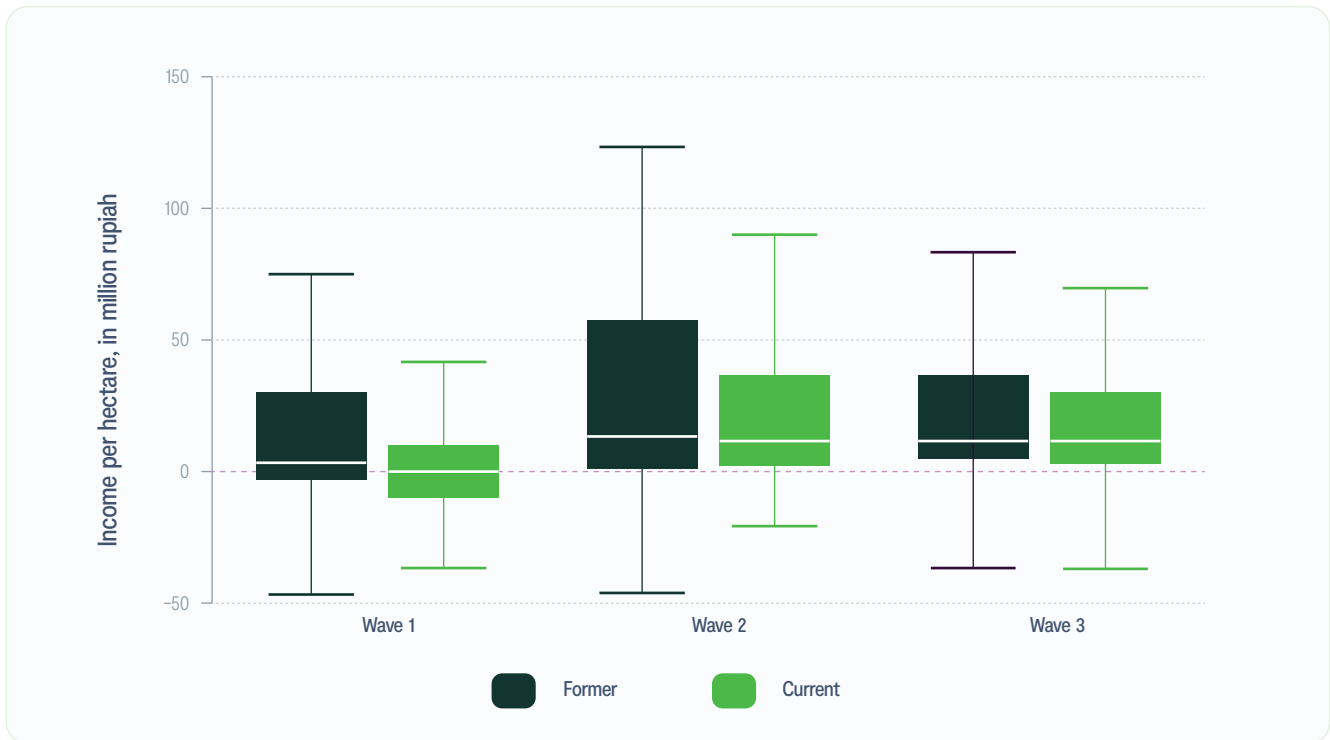
We conduct further analysis of tobacco and non-tobacco farmers’ income to better understand the distribution of income. We depict the distribution of income per hectare for both groups of farmers in Figure 3.3. As discussed in previous analysis, former tobacco farmers consistently fared better across waves. It is important to note that income varied quite a lot among both tobacco and former tobacco farmers. However, we can observe that income of former tobacco farmers was relatively more skewed upward, particularly in Wave 2 and Wave 3.

For the following analysis, we categorize various income sources into agricultural and non-agricultural incomes. Agricultural income includes

tobacco and non-tobacco farming incomes, while non-agricultural incomes include income from enterprises, agricultural and non-agricultural wage, and other income. We depict the mapping of median agricultural and non-agricultural income by region in Figure 3.4. The median agricultural income—and similarly for non-agricultural income—was calculated from both tobacco and former tobacco farmers in Central and East Java.

We can observe dynamics of both agricultural and non-agricultural incomes across waves in every region. The median agricultural income was significantly higher in Waves 2 and 3 than in Wave 1. The median agricultural income was negative in Wave 1, particularly

Figure 3-3. Median Total Household Income per Hectare of Tobacco and Non-tobacco Farmers Across Waves



Notes: The sample includes tobacco and former tobacco farmers in Central and East Java. Non-tobacco crops profit is defined as crop sales minus inputs and costs of hired labor. Non-tobacco crops income is defined as crop sales minus inputs, costs of hired labor, and household labor costs. Tobacco income is defined as tobacco sales minus inputs, costs of hired labor, and household labor costs. For each wave and for each group of farmers, we drop observations with total household income lower than the 5th and higher than the 95th percentiles. Total household income is defined as agricultural sales plus wage income, non-farming income, and other income minus input costs, rent, costs of hired labor, and household labor costs. The second and third wave incomes are adjusted for inflation.

owing to unfavorable tobacco farming outcomes. The median non-agricultural income exhibited an increasing trend across waves. There was a significant increase in non-agricultural income between Wave 2 and Wave 3, which was mainly driven by a significant increase in non-agricultural wage.

In Wave 3 TFS, former tobacco farmers in every region experienced above-median non-agricultural incomes. On the other hand, with the

exception of those in Jember and Lumajang, tobacco farmers experienced below-median non-agricultural incomes. This finding is consistent with previous findings showing that tobacco farmers rely more on agricultural income sources. The median non-agricultural income in Temanggung, Lumajang, and Bojonegoro was consistently above the median in Wave 2 and 3, which indicates that farming households have viable off-farm opportunities.

Figure 3-4. Median Agricultural by Non-Agricultural Income – by Region



Notes: The sample includes tobacco and former tobacco farmers in Central and East Java. The second and third wave incomes are adjusted for inflation.

We conduct a multivariate regression analysis to identify factors that predict farmers' income. We follow the regression specification used to analyze the effects of tobacco farming on income in Sahadewo et al. (2020b). Specifically,

$$\text{income}_{it} = \beta_0 + \beta_1 \text{tobacco}_{it} + \gamma X_{it} + \gamma_s + \alpha_1 + u_{it} \text{ (Equation 1)}$$

where i indicates household, s indicates district, t indicates time, income indicates total household income per acre of farming land and tobacco indicates the share of a household's land for tobacco farming. The vector X includes household characteristics such as log of total cultivation area, log of labor hours, log of assets, log of agriculture wage, log of non-agriculture wage, an indicator of whether farmers enter a contract, and demographics. The district dummies, γ , capture unobserved district characteristics that may be correlated with income. We also include time fixed effects in the regression using both waves of the TFS. We cluster the standard errors at the household level to

accommodate unobserved correlation of unobserved characteristics or shocks across waves within the household. We report the result of the estimation in Table 3.5.

Farmers who dedicated a larger share of land for tobacco were associated with lower income, holding all factors—including the size of cultivated land—constant. The estimated association is quite consistent across waves. We also find that farmers with larger cultivated land for tobacco and non-tobacco crops were associated with lower income. As discussed in (Sahadewo, Drope, Kartaadipoetra, et al. 2020), farmers with larger land need to dedicate more agricultural and labor inputs. The marginal costs of an additional unit of land might have exceeded its marginal revenue. We also find that non-agricultural wage income is positively associated with income. This result suggest that farmers have non-farming alternative livelihoods that could improve household income.

Table 3-5. Predicting Tobacco and Former Tobacco Farmers' Income

	A: OLS, (wave 1)	B: OLS, (wave 2)	C: OLS, (wave 3)	D: OLS, all	E: RE, all	F: FE, all
Share of land for tobacco, %	-152.3 (140.8)	-511.0*** (184.3)	-287.3** (134.9)	-332.4*** (111.4)	-332.4*** (111.4)	-325.4** (151.8)
HH total asset, in log	1834.9 (1390.4)	183.2 (608.7)	1009.2*** (349.7)	633.9 (401.2)	633.9 (401.2)	2590.2 (1759.4)
total cultivated land, in log	1951.9 (1764.9)	-11002.3*** (2767.0)	-1288.4 (1868.5)	-5084.7*** (1459.2)	-5084.7*** (1459.2)	-7509.9*** (2430.4)
agricultural wage, log	-150.6 (291.0)	-144.0 (418.8)	10.79 (204.6)	-126.0 (152.8)	-126.0 (152.8)	62.83 (233.3)
non-agricultural wage, log	339.5 (255.8)	823.0* (431.5)	274.5* (138.4)	563.1*** (166.4)	563.1*** (166.4)	528.1** (254.9)
HH labor hours, log	-11693.5** (4493.3)	-541.9 (849.2)	-293.6 (311.1)	-600.7 (641.9)	-600.7 (641.9)	-3212.0** (1356.0)
head of HH age	168.9 (305.0)	-75.26 (332.4)	390.8* (205.8)	-4.977 (173.7)	-4.977 (173.7)	-1142.0* (675.6)
HH size	4209.0 (2829.3)	2776.5 (2854.1)	-646.8 (1484.8)	1084.0 (1515.9)	1084.0 (1515.9)	4055.3 (9560.7)
HH years of schooling	-535.0 (1677.3)	594.3 (1743.0)	2006.6*** (560.5)	553.7 (729.8)	553.7 (729.8)	-2420.8 (1998.8)

	A: OLS, (wave 1)	B: OLS, (wave 2)	C: OLS, (wave 3)	D: OLS, all	E: RE, all	F: FE, all
1 if contract farmer	4023.3 (10988.5)	13511.9 (11487.7)	3935.5 (7913.9)	5925.9 (5359.7)	5925.9 (5359.7)	20592.0 (14371.8)
1 if Temanggung	5485.2 (11803.6)	-4800.7 (9810.5)	25928.6* (13635.6)	4770.2 (7855.8)	4770.2 (7855.8)	
1 if Lumajang	-13130.2 (17999.1)	-18751.4 (18656.6)	-15490.9** (7060.3)	-14405.2 (9876.1)	-14405.2 (9876.1)	
1 if Jember	4453.6 (13075.7)	3466.0 (10839.3)	1712.4 (5651.9)	3035.6 (7267.0)	3035.6 (7267.0)	
1 if Bojonegoro	-4081.5 (11699.9)	-17928.2 (10800.0)	2304.8 (4455.4)	-2755.5 (7568.9)	-2755.5 (7568.9)	
Observations	54	73	53	180	180	180
Adj. R-sq	-0.0120	0.436	0.442	0.274	0.3391	0.388
F-stats	2.039	5.136	6.793	3.659	-	2.916
Controls	Y	Y	Y	Y	Y	Y
S.E.	Robust	Robust	Robust	Cluster	Cluster	Cluster

Notes: The signs *, **, and *** indicate significance at 10, 5, and 1%, respectively. We conduct a robust Hausman test to test the null hypothesis that the difference in FE and RE coefficients are not systematic. We apply the cluster-robust bootstrap procedure and 200 bootstrap repetitions in the calculation of the robust Hausman test. The Chi-squared test statistics for the robust Hausman test is 6.34 with a p-value of 0.8981.

3.3. Poverty

We determine poverty status of tobacco and former tobacco farmers using two poverty lines. We calculate poverty status based on per-capita revenue and per-capita income presented in Table 3.6. In general, poverty rates calculated using per-capita

income were higher because household income incorporates household labor costs. In Table 3.7, we present poverty rates among tobacco and non-tobacco farmers across waves.

Table 3-6. Per-Capita Household Revenue and Income, in 1,000 Indonesian Rupiah

	Wave 1		Wave 2		Wave 3	
	Current	Former	Current	Former	Current	Former
Annual mean per-capita revenue	5,368	5,666	8,364	5,934	10,600	9,302
Annual median per-capita revenue	4,162	4,356	5,735	4,095	7,971	7,612
Annual mean per-capita income	-179	2,026	3,627	2,985	4,184	5,040
Annual median per-capita income	-317	934	2,112	1,802	3,014	4,176

Notes: The sample includes tobacco and former tobacco farmers in Central and East Java. For the calculations of a variable's mean, we drop observations below the 5th percentile and above the 95th percentile for each group of farmers in each wave. The second and third wave incomes are adjusted for inflation.

In general, poverty rates among tobacco and former tobacco farmers are significantly higher than the nationwide poverty rate, which was 9.22 percent in September 2019 (Statistics Indonesia 2020). Poverty rates were lower in Wave 2 and Wave 3 than in Wave 1. The main explanation is the unfavorable farming outcomes—particularly tobacco farming outcomes—in

the “bad” farming year of Wave 1. Interestingly, there was a significant decrease in the poverty rate among former tobacco farmers between Wave 2 and Wave 3. One of the main explanations of this decrease was that these farmers experienced a significantly higher non-agricultural wage in Wave 3 as shown in previous analyses.

Table 3-7. Poverty Status of Current and Former Tobacco Farmers

Poverty Status	Poverty at \$1.90 a day per person, PPP 2011		Poverty at National Poverty Line	
	Current	Former	Current	Former
Wave 1				
Headcount ratio measured by per capita revenue	38.74	38.74	49.56	48.63
Headcount ratio measured by per capita income	75.85	75.85	80.25	56.07
2016 Poverty line (million rupiah)	3.090		4.252	
Wave 2				
Headcount ratio measured by per capita revenue	24.22	35.81	37.89	51.35
Headcount ratio measured by per capita income	53.91	52.70	64.64	61.48
2017 Poverty line (million rupiah)	3.211		4.493	
Wave 3				
Headcount ratio measured by per capita revenue	20.32	23.21	36.14	36.31
Headcount ratio measured by per capita income	49.28	37.50	59.75	50.00
2019 Poverty line (million rupiah)	3.244		5.286	

Note: The sample includes tobacco and former tobacco farmers in Central and East Java. Total household revenue is defined as tobacco sales plus crop sales during tobacco season, crop sales during non-tobacco sales, wage income, other income, non-farming sales, and farming sales. Total household income is defined as agricultural sales plus wage income, non-farming income, and other income minus input costs, rent, costs of hired labor, and household labor costs. The national poverty line in 2016, 2017, and 2019 was IDR354,386, IDR374,477, and IDR440,538 per capita per month, respectively, according to Statistics Indonesia.

The government of Indonesia implements social assistance programs to support poor and vulnerable households including cash transfers, food subsidy, health insurance, education cash transfer, and several others. Households that are eligible to receive these programs first obtained the Social Welfare Card (*Kartu Perlindungan Sosial*, KPS) or the Family Welfare Card (*Kartu Keluarga Sejahtera*, KKS). A significant share of tobacco and former tobacco farmers obtained social assistance in various forms because many of them are considered poor as shown in Table 3.7.

In Table 3.8, we report the share of tobacco and former tobacco farmers who received various forms of social assistance. In general, the share of households who receive KPS or KKS increased over time. For example, about 20.38 percent of tobacco farmers received KPS or KKS in Wave 1 and the share increased to 27.52 percent in Wave 3. The increasing trend of KPS or KKS ownership could have been driven by expansion of social assistance programs by the government. Government expenditure for social protection program increased 32.77 percent from

IDR291.7 trillion in 2018 to IDR387.3 trillion in 2019. The government also gradually increased recipients of non-cash food assistance or *bantuan pangan non tunai* (BPNT) to 15.6 million recipients (Ministry of Finance 2019). Recipients of Social Welfare Card could have increased because the receipt is a basis for households to receive other social protection programs.

Another important finding from this analysis is that the share of tobacco farmers who obtained KPS or KKS was consistently higher than the share of

former tobacco farmers across waves. It is important to note that the share of tobacco and former tobacco farmers who received assistance from KPS/KKS or other sources dropped quite significantly in Wave 3. The main explanation of this change is the significantly lower share of households who received the rice for the poor (*raskin*) programs in Wave 3. The program was gradually transformed to non-cash food assistance program (BPNT) during the time of the survey.

Table 3-8. Participation in Social Security Card (KPS) or Family Welfare Card (KKS)

Indicators	Wave 1		Wave 2		Wave 3	
	Current	Former	Current	Former	Current	Former
Percentage of HH with KPS/KKS	20.38	17.25	22.27	20.95	27.52	23.21
Benefit 1: Percentage of HH who received cash assistance/transfer in the last year						
With KPS/KKS	1.76	1.57	9.18	6.76	12.53	9.52
Without KPS/KKS	1.38	2.75	3.52	3.38	2.46	4.17
Benefit 2: Percentage of HH who received rice for the poor (Raskin) in the last year						
With KPS/KKS	0.63	1.57	1.95	0	2.26	2.38
Without KPS/KKS	68.43	66.27	58.01	63.51	3.08	2.98
Benefit 3: Percentage of HH who received assistance for health payment in the last year						
With KPS/KKS	0.38	0.39	0.20	0.68	-	0.60
Without KPS/KKS	2.52	3.92	10.55	11.49	0.41	0.60
Benefit 4: Percentage of HH who received cash assistance for poor student in the last year						
With KPS/KKS	2.52	2.75	3.12	2.03	2.67	2.38
Without KPS/KKS	9.69	7.06	9.96	11.49	8.01	6.55
Overall percentage of households who received assistance from KPS/KKS or other sources in the last year						
One benefit	49.81	47.84	36.13	40.54	15.40	11.90
Two benefits	15.35	17.25	15.43	14.86	9.03	8.93
Three benefits	6.79	4.31	8.40	8.11	7.60	6.55
Four benefits	1.38	1.18	4.69	4.73	0.41	-
Five benefits	0.25	0.39	1.56	1.35	0.21	0.60
Total	76.23	76.86	69.92	70.95	32.65	27.98

Notes: The sample includes tobacco and former tobacco farmers in Central and East Java.

The social assistance programs implemented by the Government of Indonesia also includes the national health insurance (Jaminan Kesehatan Nasional, JKN) program. The program was first implemented as the Healthy Indonesian Card (Kartu Indonesia Sehat, KIS), and the program has subsequently been implemented as BPJS–PBI. The BPJS–PBI program is targeted towards the poorest 40 percent of households in Indonesia. Households who are not enrolled in the BPJS–PBI program are expected to be covered either through an employer-contribution scheme or by purchasing the

national health insurance out of pocket.

We present the results from further analysis of enrollment in and receipt of the JKN program in Table 3.9. The share of households who were enrolled in the JKN program exhibits an increasing trend across years. More interestingly, consistently across years, the percentage of tobacco farmers who received the national health insurance program was higher than the percentage of former tobacco farmers. The average number of household members who received the JKN program through BPJS–PBI was higher among tobacco farmers than among former tobacco farmers.

Table 3–9. Current and Former Tobacco Farmers using KIS or BPJS–PBI

Indicators	Wave 1		Wave 2		Wave 3	
	Current	Former	Current	Former	Current	Former
Percentage of HH who have KIS/BPJS–PBI						
KIS	22.77	17.65	34.38	31.76	–	–
BPJS–PBI	7.17	7.45	3.12	5.41	43.33	35.71
Both KIS & BPJS–KIS	0.75	0.39	0.78	0.68	–	–
None	69.31	74.51	61.72	62.16	56.67	64.29
Percentage of HH who have KIS & used it in the last one year	19.25	32.61	35.00	22.92	33.18	35.00
Percentage of HH with Voluntary BPJS (BPJS Sukarela/JKN)						
Plus KIS	0.38	0.39	0.78	0.68	–	–
Plus BPJS–PBI	0.38	–	–	–	0.21	2.38
Plus, both KIS & BPJS–PBI	0.13	–	–	–	–	–
Only voluntary BPJS	4.15	7.84	4.88	5.41	9.24	8.33
None	94.97	91.76	94.34	93.92	90.55	89.29
Percentage of HH who have voluntary BPJS & used it in last one year	40.00	23.81	44.83	55.56	39.13	61.11
Average Number of HH members Who Own:						
KIS	3.20	3.09	3.00	2.88	–	–
BPJS–PBI	2.44	2.85	3.60	2.67	3.21	2.87
Voluntary BPJS	2.33	2.43	2.31	2.22	2.28	2.44

Notes: The sample includes tobacco and former tobacco farmers in Central and East Java.

3.4. Land Use

In the TFS, we asked respondents about land ownership and cultivation in the past 12 months, including the wet and dry seasons. We present the detailed analysis of land ownership and land use in Table 3.10. The size of land for cultivation—tobacco and non-tobacco—and land owned vary considerably between current and former tobacco farmers. On average, tobacco farmers cultivated larger tracts of land than former tobacco farmers. However, the share of lands owned was generally higher among former tobacco farmers than among tobacco farmers.

We can also observe considerable variation of land cultivated and land owned across regions and waves. Current and former tobacco farmers in East

Java consistently owned and cultivated larger land sizes than their counterparts in Central Java. For example, in Wave 3 of TS, the median farmer in Jember cultivated 0.40 hectares of land for tobacco and 1.17 hectares of land for non-tobacco crops. In contrast, the median farmer in Magelang cultivated 0.20 hectares of tobacco land and 0.51 hectares of land for non-tobacco crops. In general, the size of cultivated land and land owned were higher in Wave 2 and Wave 3 TFS than in Wave 1. A potential explanation—which will be discussed in more detail in subsequent sections—is that Wave 1 was a “bad” year for farming in general, while Wave 2 and Wave 3 were generally better for tobacco farming.

Table 3-10. Median Total Land Owned (hectares), Under Cultivation and Tobacco Cultivation by Region, Current and Former Tobacco Farmers

Wave	Tobacco	Current		Former	
		Cultivated	Owned	Cultivated	Owned
Wave 1					
Bojonegoro	0.16	0.60	0.25	0.52	0.25
Jember	0.20	0.53	0.13	0.18	0.19
Lumajang	0.23	0.54	0.19	0.60	0.20
Magelang	0.06	0.20	0.10	0.08	0.05
Temanggung	0.35	0.78	0.30	0.01	0.18
Wave 2					
Bojonegoro	0.28	1.21	0.40	0.98	0.30
Jember	0.30	1.05	0.25	0.12	0.11
Lumajang	0.17	0.48	0.11	0.50	0.25
Magelang	0.13	0.38	0.18	0.34	0.18
Temanggung	0.25	0.63	0.39	0.14	0.19
Wave 3					
Bojonegoro	0.25	1.06	0.29	0.70	0.28
Jember	0.40	1.17	0.35	0.90	0.46
Lumajang	0.34	1.53	0.42	1.25	0.50
Magelang	0.20	0.51	0.35	0.11	0.16
Temanggung	0.36	0.84	0.49	0.08	0.10

Notes: The sample includes tobacco and former tobacco farmers in Central and East Java.

We report the results of analyses of legal entitlement to land for both tobacco and former tobacco farmers in Table 3.11. We analyze legal entitlement using parcel as the main unit because it is quite common for farmers in Central and East Java to own more than a parcel of land. The number of parcels increased slightly between Wave 2 and Wave 3 TFS. However, the number of parcels in the two previous waves was significantly lower than the number of parcels in Wave 1.

The share of land owned among tobacco farmers exhibits an increase trend across waves. In Wave 1 TFS, the share of land owned among tobacco farmers was 65.04 percent. The share increased to 72.63 percent in Wave 3 TFS. While the share of land owned by former tobacco farmers decreased in Wave 2, this share increased again in Wave 3 to a level higher than that in Wave 1 and, on average, higher than current tobacco farmers across all three waves.

Table 3-11. Legal Entitlement of Land – Current and Former Tobacco Farmers, by Parcel

	Wave 1			Wave 2			Wave 3		
	Current	Former	Total	Current	Former	Total	Current	Former	Total
Granted by local leader	0.65	0.60	0.64	0.36	0.99	0.47	1.10	-	0.91
Owned	65.04	73.56	66.75	71.23	68.98	70.83	72.63	77.44	73.68
Rented	22.26	15.51	20.91	18.79	18.48	18.74	24.58	19.30	23.37
Tenant (no rent)	11.30	9.94	11.03	3.08	5.61	3.54	0.95	3.26	1.47
Other	0.75	0.40	0.68	6.53	5.94	6.42	0.73	-	0.57
Total	2,008	503	2,511	1,394	303	1,697	1,363	399	1,763

Note: The sample includes only Wave 3 tobacco and former tobacco farmers in Central and East Java.



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Part 4

The Economics of Tobacco Growing

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4. The Economics of Tobacco Growing

4.1. Characteristics of Tobacco Farming: Contracts, Production, and Prices

We report the types of tobacco grown across regions in Table 4.1. The most common type of tobacco grown is Virginia leaf. The share of Virginia leaf was about 58 percent in Wave 3 TFS, down from 70 percent in Wave 2 TFS. Virginia leaf is popular among tobacco farmers in Indonesia because of farmers' beliefs regarding its relative values in the market. It is interesting to note that the share of Burley leaf

increased quite significantly in Wave 3 TFS. The share of Burley was just 6.7 percent in Wave 2 TFS, and it increased to 27 percent in Wave 3 TFS. Interestingly, Burley leaf was planted in every region in the study sample. Aside from the Virginia, Burley, and Oriental, farmers plant domestic tobacco leaves such as Gobel, Gober, Pelus, Soker Jumbo, and Tembakau 68.

Table 4-1. Type of Tobacco Farming Enterprise by Region

	Wave 1			Wave 2				Wave 3			
	Virginia	Burley	Oriental	Virginia	Burley	Oriental	Other	Virginia	Burley	Oriental	Other
Bojonegoro	316	0	72	431	0	34	36	449	147	12	0
Jember	483	18	1	557	27	2	8	219	165	71	143
Lumajang	62	96	0	35	91	0	62	123	53	5	3
Magelang	154	0	0	11	0	8	163	210	55	4	0
Temanggung	313	0	0	183	0	4	86	83	85	47	0
Total	1,326	114	73	1,217	118	48	355	1,084	505	139	146

Note: The sample includes only Wave 3 tobacco and former tobacco farmers in Central and East Java.

We present the analysis of the distribution of contract and independent tobacco farmers by region in Table 4.2. Tobacco farmers generally grow leaf without contracts with leaf buying companies, meaning that they enter the market as independent sellers. In Wave 3 TFS, 85.22 percent of total tobacco farmers were independent farmers. The remaining 14.78 percent of tobacco farmers have either an informal or a formal contract with tobacco leaf buyers. When farmers do enter such contracts, the terms often involve buyers providing access to agricultural inputs – particularly fertilizer – and in some cases access to credit. All inputs are costed, often above market value,

and are deducted from the final leaf sales.”

The portion of farmers in contractual relationships with buyers varies by region. In Jember, Temanggung, and Magelang, at least 90 percent of tobacco farmers are independent. The share of independent farmers in Bojonegoro was also significant at about 82.61 percent. The share of contract farmer is quite high in Lumajang at 65.33 percent. In Wave 3 TFS, almost half of tobacco farmers in Lumajang had some form of contract with leaf buyers who are mainly individual collectors or middlemen. Analysis of tobacco leaf buyers will be

Table 4-2. Distribution of Contract and Independent Tobacco Farmers by Region

	Wave 1					Wave 2					Wave 3				
	Contract	%	Ind.	%	Total	Contract	%	Ind.	%	Total	Contract	%	Ind.	%	Total
Bojonegoro	51	21.25	189	78.8	240	26	19.55	107	80.45	133	24	17.39	114	82.61	138
Jember	31	12.92	209	87.1	240	20	14.49	118	85.51	138	13	9.22	128	90.78	141
Lumajang	49	65.33	26	34.7	75	31	37.35	52	62.65	83	28	48.28	30	51.72	58
Magelang	1	0.83	119	99.2	120	1	1.25	79	98.75	80	0	0.00	72	100.00	72
Temanggung	7	5.83	113	94.2	120	6	7.69	72	92.31	78	7	8.97	71	91.03	78
Total	139	17.48	656	82.5	795	84	16.41	428	83.59	512	72	14.78	415	85.22	487

Note: The sample includes only Wave 3 tobacco and former tobacco farmers in Central and East Java.

Tobacco farmers’ decisions to enter a tobacco-growing contract can be influenced by various factors such as socioeconomic characteristics and farming outcomes. We conduct a logistic regression analysis to analyze correlates of tobacco farmers’ decisions. The dependent variable is a binary variable that is equal to 1 if a tobacco farmer entered a formal or informal tobacco-growing contract and 0 otherwise. The explanatory variables for the logistic regression are drawn from existing literature that investigates factors associated with entering into a tobacco growing contract (Chavez et al. 2016; Goma et al. 2017; Makoka et al. 2017). Specifically, the explanatory variables include socio-economic characteristics, household farming choices, and household economic outcomes. We also include district fixed effects to accommodate time-invariant characteristics specific to each district. Lastly, we include time fixed effects to accommodate year-specific shocks that affect all tobacco farmers.

Coefficients of logistic regressions are not particularly meaningful. Therefore, we report average

marginal effects of the logistic regression for Wave 1, Wave 2, Wave 3, and all Waves in Table 4.3. Average marginal effects indicate the change in the likelihood of entering a tobacco-growing contract owing to a unit change in the explanatory variable holding all else constant. The analysis shows that more experienced households are significantly associated with a lower likelihood of entering tobacco-growing contracts. Households with higher wage income—both agricultural and non-agricultural—are also associated with a lower likelihood of entering into a tobacco-growing contract. One explanation among others is that these households have adequate resources to finance tobacco growing independently. On the other hand, households with larger cultivated lands and those with larger shares of land for tobacco are associated with a higher likelihood of entering into a tobacco-growing contract. A potential explanation is that these households would need more capital to grow the larger shares of land for tobacco.

Table 4-3. Logistic Regression of Tobacco Households' Decisions to Enter into a Tobacco-Growing Contract: Average Marginal Effects

Dependent variable: 1 if a tobacco farmer in a tobacco-growing contract	A: wave 1	A: wave 2	A: wave 3	A: wave 1 - 3
<i>HH characteristics</i>				
HH total asset, in log	0.00527 (0.00455)	-0.00453 (0.00528)	0.00200 (0.00982)	-0.0000713 (0.00463)
HH labor hours, log	0.0164 (0.0150)	-0.0246* (0.0140)	-0.00905 (0.0113)	-0.00500 (0.00759)
head of HH age	0.0145 (0.0109)	-0.0106 (0.00962)	0.00483 (0.0143)	0.00620 (0.00648)
head of HH age, squared	-0.000130 (0.000110)	0.000119 (0.0000952)	-0.0000385 (0.000133)	-0.0000491 (0.0000641)
HH size	-0.00266 (0.00960)	0.00226 (0.0112)	-0.0125 (0.0108)	-0.00229 (0.00627)
HH years of schooling	0.00823** (0.00374)	0.00331 (0.00513)	-0.00265 (0.00395)	0.00442* (0.00254)
HH farming experience	-0.00649*** (0.00113)	-0.00823*** (0.00142)	-0.00213 (0.00149)	-0.00590*** (0.000798)
<i>Farming Outcomes</i>				
HH profit per area, PPP	-0.286 (0.330)	0.00125*** (0.000369)	1.958 (1.201)	0.00104*** (0.000228)
agricultural wage, log	-0.0000489 (0.000958)	-0.00172 (0.00139)	-0.00350** (0.00163)	-0.00120* (0.000720)
non-agricultural wage, log	-0.00126 (0.000967)	-0.0000652 (0.00162)	-0.00123 (0.00124)	-0.00145** (0.000704)
farming sales, log	0.00387** (0.00167)	0.00134 (0.00340)	0.00154 (0.00177)	0.00222* (0.00118)
non-farming sales, log	0.000210 (0.000821)	-0.00329*** (0.00113)	0.000311 (0.00113)	-0.000556 (0.000588)
total cultivated land, in log	0.0193*** (0.00612)	0.0661*** (0.0131)	0.0471*** (0.0124)	0.0304*** (0.00528)
land share, tobacco	0.00157*** (0.000521)	0.00186** (0.000746)	0.00215** (0.000854)	0.00153*** (0.000380)
1 if owned at least one parcel	0.0736*** (0.0268)	0.104** (0.0503)	0.0337 (0.0571)	0.0653*** (0.0220)
<i>District Fixed Effects</i>				
1 if Temanggung	0.151 (0.111)	0.170 (0.124)	1.368*** (0.169)	0.206** (0.0800)
1 if Lumajang	0.521*** (0.101)	0.492*** (0.112)	1.712*** (0.176)	0.558*** (0.0761)
1 if Jember	0.229** (0.103)	0.223* (0.116)	1.371*** (0.175)	0.262*** (0.0771)
1 if Bojonegoro	0.327*** (0.0992)	0.255** (0.117)	1.480*** (0.171)	0.343*** (0.0751)
<i>Year Fixed Effects</i>				
wave 2				0.000422 (0.0218)
wave 3				-0.0203 (0.0226)
Observations	795	437	404	1636
Standard Errors	Robust	Robust	Robust	Robust

Notes: The sample includes tobacco and former tobacco farmers in Central and East Java. The signs *, **, and *** indicate significance at 10, 5, and 1%, respectively. The omitted district is Magelang. Robust standard errors are in parentheses.

The volume of tobacco leaf sold exhibits an increasing trend across waves, while prices varied across waves. We present the analyses of volume of leaf sold, prices, and sales revenues in Table 4-4. The median volume of tobacco leaf sold—which doubled between Wave 1 and Wave 2—increased about another 26.5 percent to 506kg in Wave 3. Lumajang experienced the highest increase in volume of leaf sold with an increase of 60 percent, followed by Bojonegoro with an increase of 43 percent. Contrary to the other regions, the median volume sold in Temanggung declined by about 14 percent to 240kg in Wave 3.

In general, tobacco farmers enjoyed significantly higher prices in Wave 2 with an increase of approximately 20 percent. Overall, median prices in

Wave 3 were lower by about 24 percent than in Wave 2 and Wave 1. However, changes in median tobacco prices varied by regions. Median prices increased in Temanggung and Lumajang, but decreased in Bojonegoro, Jember, and Magelang.

Median sales revenues increased by 78 percent in Wave 2. In contrast, median sales revenues decreased in the following wave by 19 percent, illustrating the fluctuations of sales revenues over time. The decrease in sales revenues in Wave 3 was mainly driven by the decrease in prices. There are notable variations across regions. Median sales were higher in Wave 3 than in Wave 2 in Bojonegoro, Magelang, and Temanggung. However, sales in Jember and Lumajang were lower in Wave 3 than in Wave 2.

Table 4-4. Median Tobacco Volume of Leaf Sold, Prices, and Sales Revenues by Region

Region	Volume Sold (kg)			Price per kg (IDR)			Sales (1,000 IDR)		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
Bojonegoro	179	455	650	6,000	6,730	5,466	400	673	797
Jember	200	550	600	15,000	31,730	22,779	1,535	4,183	3,173
Lumajang	240	298	478	25,000	28,846	30,979	2,337	4,038	2,733
Magelang	290	340	393	3,000	4,615	4,555	700	600	683
Temanggung	270	280	240	35,000	67,307	72,892	1,590	2,826	4,592
Total	204	400	506	20,000	24,038	18,223	1,075	1,923	1,610

Note: the sample includes tobacco and former tobacco farmers in Central and East Java. The prices and sales in the second and third wave are adjusted for inflation.

We also find variation in volume of tobacco leaf sold, prices, and sales revenues by tobacco leaf types. In Table 4.5, we report analyses of volume of tobacco leaf sold, prices, and sales revenues for Virginia, Burley, and Oriental types. In general, median volume sold was higher in Wave 3 with an increase of 25 percent from the previous wave. There was a notable decrease in median volume sold for the Burley type. The decrease is notable because, as reported in a previous table, there were more farmers who planted Burley leaf in Wave 3. The significant changes in the medians for the Burley and Oriental do not affect the

overall median as Virginia accounts for the majority of leaf grown in Central and East Java.

The median price of Virginia leaf was also significantly lower in Wave 3, a decrease of almost 36 percent from the median in Wave 2. The significantly lower median price of Virginia leaf was the main explanation of the overall lower median price of tobacco. Lower median prices of Virginia leaf also resulted in lower sales revenues. The median price of Burley leaf was also lower in Wave 3. The lower median price and the lower volume sold led to significantly

lower sales revenues of Burley leaf in Wave 3. Despite more farmers growing Burley in Wave 3, Burley in general did not generate strong sales revenues. In

contrast, the median price for Oriental was significantly higher in Wave 3, which led to higher median sales revenues.

Table 4-5. Median volume of Tobacco Leaf Sold, Price, and Sales Revenues by Leaf Type

Region	Volume Sold (kg)			Price per kg (USD PPP)			Sales (USD PPP)		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
Virginia	233	499	500	16,000	24,038	15,490	1,000	1,923	1,212
Burley	210	695	450	25,000	25,000	17,312	1,807	5,488	1,739
Oriental	120	260	580	25,000	25,961	36,447	2,000	4,230	4,337
Total	200	400	500	20,000	24,038	18,223	1,075	1,923	1,611

Note: the sample includes tobacco and former tobacco farmers in Central and East Java. The prices and sales in the second and third wave are adjusted for inflation.

Another important aspect of farmers' livelihoods is the variation of tobacco prices by grade and leaf type. We present the analysis of median tobacco price by grade and leaf type in Table 4.6. As shown in the previous tables, the median prices of Virginia and Burley leaf were lower in Wave 3 than in Wave 2. For Virginia leaf, the most notable decrease was the median price of grade D. The median price

decreased by a staggering 66 percent. The median prices of Oriental leaf increased quite significantly particularly for grades A, B, and C. It is important to note that variations in median prices do not necessarily reflect the grades of tobacco leaf. This feature of the data is beyond the scope of the study and warrants a further investigation.

Table 4-6. Median Tobacco Price by Grade and Leaf Type

Grade	Virginia			Burley			Oriental		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
A	18,000	25,961	18,223	32,500	27,884	15,489	23,000	28,846	46,697
B	15,000	22,115	18,223	25,000	29,615	18,223	28,000	36,057	41,002
C	10,000	19,230	13,667	20,500	20,192	14,578	23,000	25,961	36,446
D	20,000	28,846	9,567	18,000	-	13,667	27,000	40,865	14,578
Total	16,000	24,038	15,489	25,000	25,000	17,312	25,000	25,961	36,446

Note: the sample includes tobacco and former tobacco farmers in Central and East Java. The prices and sales in the second and third wave are adjusted for inflation.

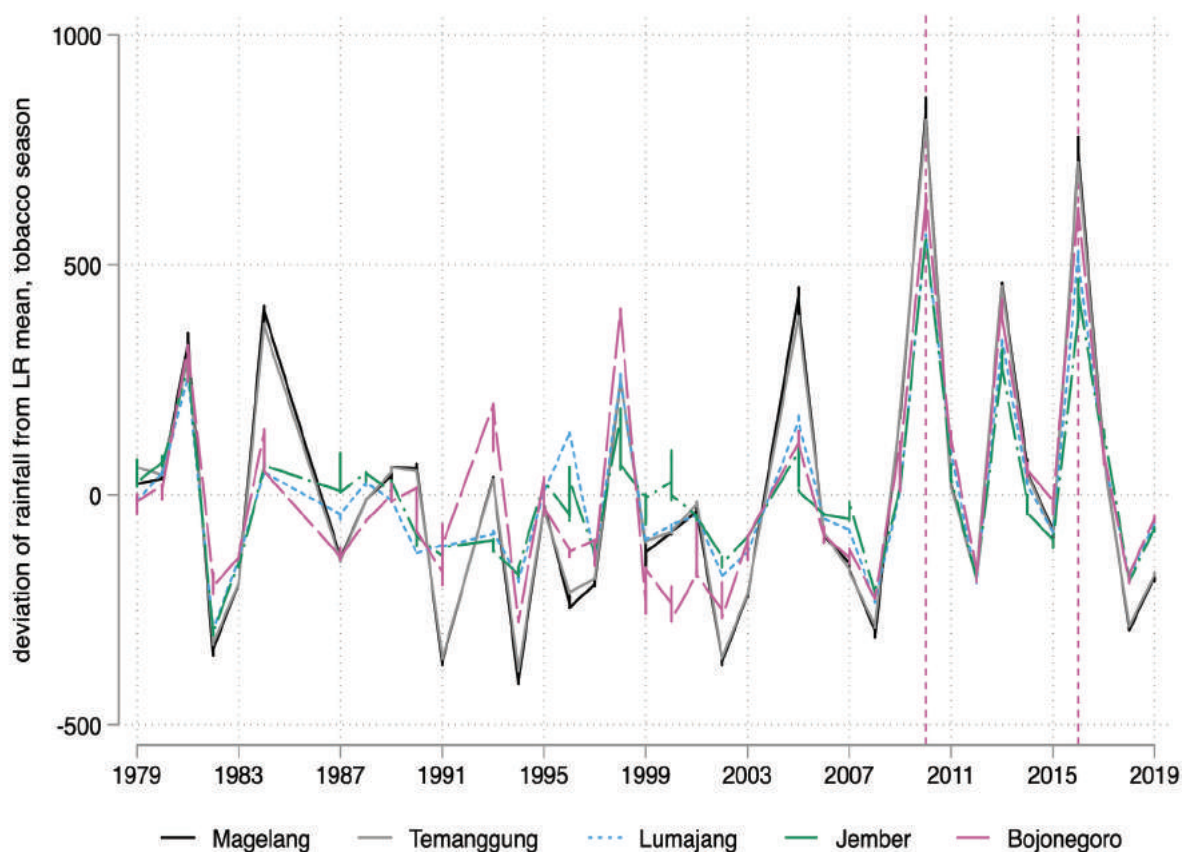
Variations in prices across waves can be explained by, among others, variations in weather, particularly rainfall. A previous study shows that weather conditions around pre-harvest period is one of the determinants of tobacco quality (Syahid Muttaqin et al. 2019). Tobacco quality is typically

higher when the conditions are relatively dry. We proxy such conditions using rainfall during the tobacco planting season. We depict deviation of rainfall from long-term average during tobacco planting season across years in Figure 4.1. In Wave 1, the conditions were presumably not favorable for tobacco farming

because of higher-than-average rainfall. Thus, volume sold, and prices were lower in Wave 1. Rainfalls during tobacco planting season in Wave 2 and Wave 3 were close, if not below, the long-run average. Such conditions are more suitable for tobacco farming,

which was evident from higher tobacco volume sold and higher prices. It is important to note that tobacco prices were generally lower in Wave 3 than in Wave 2, which can be driven by broader supply and demand dynamics that cannot be accounted with our data.

Figure 4-1. Deviation of Rainfall from Long-term Average during Tobacco Planting Season (in mm), 1988-2017



Source: Calculated using US National Oceanic and Atmospheric Agency data.

We present analysis of the type of tobacco leaf buyers by region in Table 4.7. The overwhelming majority of tobacco leaf buyers across regions were individual middlemen or collectors. As discussed previously, some of tobacco farmers have either a formal or informal contract with individual middlemen. In Bojonegoro, about 87 percent of tobacco farmers sold their leaf to individual middlemen. A notable

portion of tobacco farmers also sold tobacco leaf to company either through company collectors or directly to the warehouse. It is interesting to note that in Wave 3 there were significantly more Lumajang tobacco farmers who sold their leaf to cigarette company warehouse. The pattern shifted from selling to company collector in Wave 2 to selling to cigarette company warehouse in Wave 3.

Table 4-7. Type of Tobacco Leaf Buyers by Region

Region	Individual Middlemen/ collector	Other Farmers	Contract Representative	Company Collector	Cigarette Company Warehouse	Cigarette Company	Other	Total
Wave 1								
Bojonegoro	309	13	5	25	36	-	-	388
Jember	389	15	1	30	58	7	2	502
Lumajang	10	2	17	76	39	14	-	158
Magelang	118	11	-	3	21	1	-	154
Temanggung	217	21	17	5	32	21	-	313
Wave 2								
Bojonegoro	399	43	-	3	53	2	1	501
Jember	479	14	27	15	59	-	-	594
Lumajang	45	19	3	113	-	2	6	188
Magelang	154	23	-	-	3	-	2	182
Temanggung	234	13	4	10	6	6	-	273
Wave 3								
Bojonegoro	529	13	-	22	44	-	-	608
Jember	478	12	3	30	75	-	-	598
Lumajang	31	15	-	31	102	-	5	184
Magelang	231	19	-	10	5	4	-	269
Temanggung	162	15	-	17	20	-	-	214

Note: the sample includes tobacco and former tobacco farmers in Central and East Java.

Given insights from the analysis above, we conduct regression analyses to identify predictors of tobacco prices. We use transaction-level data and the following specification to identify predictors of tobacco prices. Specifically, we can observe several transactions for each farmer in the data. Suppose that $prices_{ijst}$ refers to price of tobacco from transaction i by farmer j in village s at time t , then:

$$\ln(prices_{ijst}) = \beta + \gamma X_{it} + \gamma_s + T_t + u_{ijs}$$

The vector X includes standardized rainfall in the region, dummies for types of tobacco, dummies for stage of tobacco processing, dummies for leaf grade, and dummies for types of tobacco leaf buyers. We also include village fixed effects and wave fixed effects to account for village and wave-specific unobserved heterogeneity. We cluster the standard errors at the farmers level. We report the results in Table 4.8.

Table 4-8. Predictors of Tobacco Prices, Wave 1-3

	B: Wave 1	C: Wave 2	D: Wave 3
Rainfall deviation from long-run average	-5.563*** (1.046)	15.89*** (0.807)	-6.484*** (2.165)
Buyers, base category: individual middlemen			
1 if other farmers	-0.168 (0.123)	-0.173** (0.0765)	-0.0750 (0.0993)
1 if contract representative	0.182** (0.0924)	-0.100 (0.106)	0.237* (0.136)
1 if company collector	0.217*** (0.0796)	-0.0536 (0.0897)	0.210*** (0.0798)
1 if cigarette company warehouse	0.446*** (0.0705)	0.0218 (0.0957)	0.281*** (0.0748)
1 if cigarette company	0.628*** (0.0933)	0.206*** (0.0605)	0.346 (0.238)
Stage of leaf processing, base category: wet leaf			
1 if sliced dried-leaves	2.153*** (0.163)	2.350*** (0.135)	2.127*** (0.218)
1 if oven dried-leaves (<i>krosok</i>)	1.576*** (0.168)	1.832*** (0.308)	2.027*** (0.248)
1 if sun dried-leaves	1.721*** (0.177)	1.898*** (0.232)	1.904*** (0.255)
Type of tobacco, base category: Virginia			
1 if Burley	0.161 (0.161)	-0.243* (0.141)	0.00705 (0.0376)
1 if Oriental	0.982*** (0.225)	0.0952 (0.138)	-0.00312 (0.0680)
Leaf grade, base category: Grade D			
1 if grade A	-0.240*** (0.0475)	-0.0784** (0.0381)	-0.114*** (0.0361)
1 if grade B	-0.633*** (0.0545)	-0.295*** (0.0538)	-0.341*** (0.0352)
1 if grade C	-0.716*** (0.0675)	-0.355*** (0.0833)	-0.613*** (0.0664)
Observations	1877	1877	1877
Adj.R.sq.	0.643	0.643	0.643
Wave dummies	n.a.	n.a.	n.a.
Village FE	Y	Y	Y
Cluster SE	Farmer	Farmer	Farmer

Notes: The sample includes tobacco and former tobacco farmers in Central and East Java.

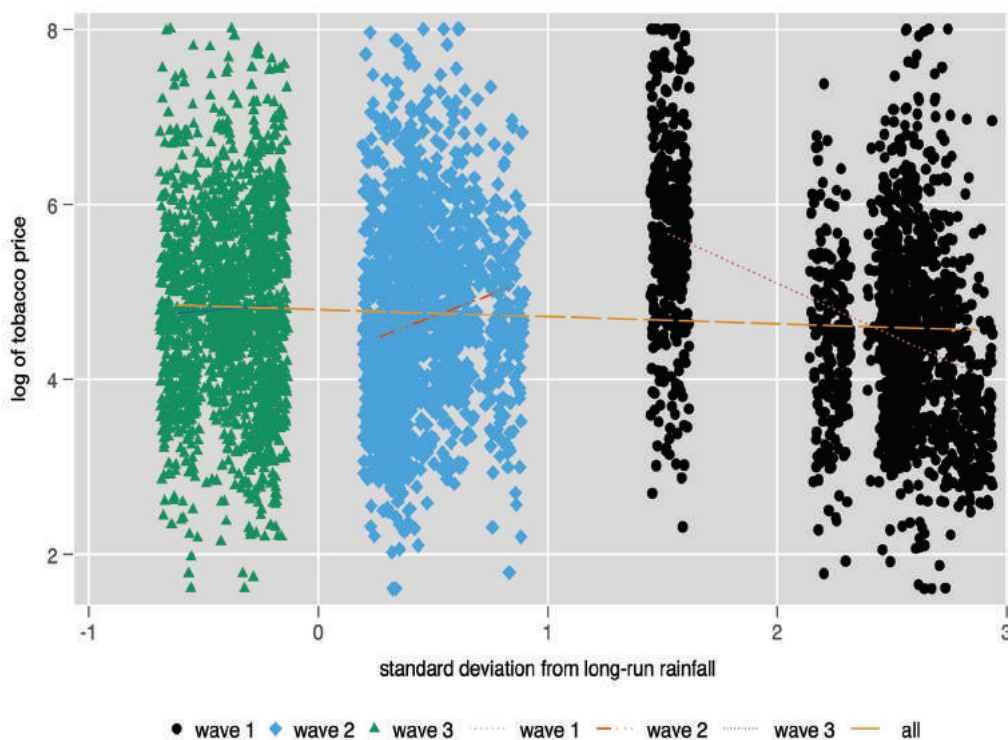
Tobacco farmers expect rainfall particularly at the beginning of the tobacco farming season as it would help the growth of the seed. However, high amounts of rainfall close to the harvest would reduce the leaf quality. We find that in general higher rainfall is associated with lower tobacco prices. However, as shown in Figure 4-2, there are important variations across waves. In the first wave, the amount of rainfall during the tobacco season was significantly higher than the long-run average. Farmers were reporting that quality of tobacco leaf was bad owing to too much moisture. In this wave, higher rainfall was associated with lower tobacco prices. We find similar finding for the third wave during which the amount of rainfall was just below the long-run average. On the other hand, in wave 2, higher rainfall is associated with higher prices. In this wave, the amount of rainfall is close to the long-run average and rainfall could be beneficial towards tobacco farming in this case.

We also find that prices vary by types of buyers. In general, farmers receive higher prices when

buyers were company collector, cigarette company warehouse, or cigarette company relative to individual middlemen. The explanation is that the value chain is shorter when farmers sell directly to company. Farmers also receive higher prices for various types of dried tobacco leaf than for wet tobacco leaf. We note that there is a possibility of an omitted variable bias issue particularly the global market forces. These findings warrant further research.

Oriental tobacco leaf was priced higher than Virginia and Burley tobacco leaf in the first wave. Burley tobacco leaf was priced lower than Virginia tobacco leaf in the second wave. We find no significant difference in tobacco prices between tobacco types in Wave 3. Lastly, we find that prices vary uniformly over reported grade as well. For example, grade B leaf price was lower than grade A leaf price by roughly 7.50 percent. Grade C and D leaf price was also significantly lower than grade A leaf price by roughly 36.30 and 53.60%, respectively.

Figure 4-2. Rainfall and Log of Tobacco Price, by waves.



Note: The sample includes tobacco and former tobacco farmers in Central and East Java. Various lines in the figure correspond to predictions from linear regression models.

4.2. Costs of Tobacco Farming

In this section, we discuss costs of tobacco farming which include analyses of both agricultural (e.g., gasoline, fertilizer, other agricultural chemicals, etc.) and labor input costs. We also compare costs of current and former tobacco farming.

We first start with analyses of the types of agricultural inputs used for tobacco farming and costs associated with each input, and we report the analyses in Table 4.8. In general, the types of agricultural inputs used were quite consistent across waves. All tobacco farmers used fertilizers—both non-organic and

organic—for tobacco growing. There was no notable increase in average costs of fertilizers between Wave 2 and Wave 3. However, we observe a 67 percent increase in the average costs of gasoline for tobacco farming equipment. There were no significant changes in gasoline prices between 2018 and 2019. One of the main explanations for the large increase was the higher tobacco volume sold, thus yield, in Wave 3. Another notable increase was costs of transportation to market, and presumably to account for the higher volume sold.

Table 4-9. Main Inputs for Tobacco Farming and Average Cost (Current Dry Season)

Input	Wave 1		Wave 2		Wave 3	
	Proportion of Farmers Who Used the Item (%)	Average Costs (1,000 IDR)	Proportion of Farmers Who Used the Item (%)	Average Costs (1,000 IDR)	Proportion of Farmers Who Used the Item (%)	Average Costs (1,000 IDR)
Fertilizer non-organic	97.99	1,000	97.85	1,009	99.59	1,129
Fertilizer	45.91	1,408	49.22	1,209	46.41	1,256
Pesticides (chemicals)	80.00	274	90.04	218	92.20	321
Gasoline for tobacco farming equipment	38.49	307	22.85	337	27.10	565
Oil	13.58	256	15.23	61	4.52	98
Firewood/fuel wood	4.65	556	8.59	930	7.80	736
Bamboo, bamboo sticks, rice hay, descale-ride	46.79	-	54.10	.	46.61	-
Knapsack Sprayer	82.01	-	92.38	.	90.55	-
Drums	22.77	-	30.66	.	27.52	-
Sprinkler	68.30	-	78.91	.	79.26	57
Rental of equipment/livestock	37.74	609	43.95	546	51.54	583
Transportation (to market)	47.67	-	78.52	222	84.80	419
Water pump	22.01	-	25.78	.	31.21	-
Mattock, sickle	99.62	-	99.41	.	99.38	-
Others	10.44	682	12.30	1,208	45.59	1,008

Note: The sample includes tobacco and former tobacco farmers in Central and East Java. The costs in the second and third wave of the survey are adjusted for inflation.

We report analysis of agricultural inputs used by tobacco farmers for cultivating non-tobacco crops in Table 4.9. We distinguish between cultivation of non-tobacco crops during the dry season and the wet season. In general, agricultural inputs expenditure for non-tobacco crops was higher during the wet season because tobacco farmers only grow non-tobacco crops. For example, in Wave 3, tobacco farmers spent

an average of Rp1.105 million for non-organic fertilizer in the wet season; twice what they spent in the dry season. The pattern was similar for other agricultural inputs. In the dry season, tobacco farmers spent more resources for tobacco than for non-tobacco crops. In Wave 3, tobacco farmers spent Rp1.129 million for non-organic fertilizers, but they spent only half of the costs of fertilizers for non-tobacco crops.

Table 4-10. Tobacco Farmers' Inputs for Cultivating Nontobacco Crops

Input	Dry Season		Wet Season	
	Proportion of Farmers Who Used the Item (%)	Average Costs (1,000 IDR)	Proportion of Farmers Who Used the Item (%)	Average Costs (1,000 IDR)
Wave 1				
Fertilizer non-organic	84.94	435	98.13	875
Fertilizer	41.87	276	61.28	642
Pesticides (chemicals)	60.54	216	83.44	391
Gasoline for tobacco farming equipment	31.02	159	35.65	326
Oil	8.13	44	10.15	78
Firewood/fuel wood	0.30	5	0.80	147
Bamboo, bamboo sticks, rice hay, descale-ride	11.45	.	15.35	.
Knapsack Sprayer	63.55	.	85.71	.
Drums	19.28	.	14.55	.
Sprinkler	52.71	.	26.57	.
Rental of equipment/livestock	31.93	384	50.87	540
Transportation (to market)	32.83	.	40.99	.
Water pump	21.99	.	16.96	.
Mattock, sickle	97.29	.	99.47	.
Others	3.92	719	6.68	996
Wave 2				
Fertilizer non-organic	89.78	533	96.52	1,427
Fertilizer	50.00	406	56.15	722
Pesticides (chemicals)	71.53	196	89.34	323
Gasoline for tobacco farming equipment	14.96	173	12.09	151
Oil	8.76	41	4.51	51
Firewood/fuel wood	0.00	.	0.41	144
Bamboo, bamboo sticks, rice hay, descale-ride	16.42	.	20.70	.
Knapsack Sprayer	74.82	.	90.57	.
Drums	21.17	.	13.32	.
Sprinkler	56.93	.	31.56	.
Rental of equipment/livestock	36.50	381	50.41	660
Transportation (to market)	68.25	122	72.75	150
Water pump	22.99	.	14.55	.
Mattock, sickle	95.99	.	98.57	.
Others	8.76	305	10.04	547

Input	Dry Season		Wet Season	
	Proportion of Farmers Who Used the Item (%)	Average Costs (1,000 IDR)	Proportion of Farmers Who Used the Item (%)	Average Costs (1,000 IDR)
Wave 3				
Fertilizer non-organic	87.45	565	98.02	1,105
Fertilizer	47.70	365	52.53	794
Pesticides (chemicals)	72.80	329	90.33	349
Gasoline for tobacco farming equipment	21.34	360	18.24	197
Oil	1.67	51	0.88	101
Firewood/fuel wood	-	-	0.44	50
Bamboo, bamboo sticks, rice hay, descale-ride	17.99	-	18.46	-
Knapsack Sprayer	73.22	-	91.65	-
Drums	23.85	-	14.51	-
Sprinkler	58.16	-	29.23	-
Rental of equipment/livestock	41.00	275	59.78	708
Transportation (to market)	74.06	172	86.15	242
Water pump	23.01	-	21.32	-
Mattock, sickle	93.31	-	99.12	-
Others	27.62	588	33.63	720

Note: The sample includes tobacco and former tobacco farmers in Central and East Java. The costs in the second and third wave of the survey are adjusted for inflation.

We report agricultural inputs that former tobacco farmers used for cultivating non-tobacco crops and their cost in Table 4.10 for both the dry and wet season. In Wave 3, we find no notable difference in the use and costs of agricultural inputs by former tobacco farmers for growing non-tobacco crops. The only notable difference is that the costs of equipment rental or livestock was higher in the wet season than the costs in the dry season.

The share of former tobacco farmers that used fertilizers is similar to the share of tobacco farmers that used fertilizers. However, a larger share of tobacco farmers utilized chemicals for pesticides. In Wave 3, about 92.20 percent of tobacco farmers used pesticides for tobacco growing. In contrast, about 71.98 of former tobacco farmers used chemicals to grow non-tobacco crops.

Table 4-11. Former Tobacco Farmers' Main Inputs for Cultivating Nontobacco Crops

Input	Dry Season		Wet Season	
	Proportion of Farmers Who Used the Item (%)	Average Costs (1,000 IDR)	Proportion of Farmers Who Used the Item (%)	Average Costs (1,000 IDR)
Wave 1				
Fertilizer non-organic	91.79	915	97.07	930
Fertilizer	53.62	1,120	54.63	705
Pesticides (chemicals)	71.98	634	83.90	411
Gasoline for tobacco farming equipment	42.51	226	41.46	219
Oil	14.01	62	18.05	70
Firewood/fuel wood	0.48	100	.	.

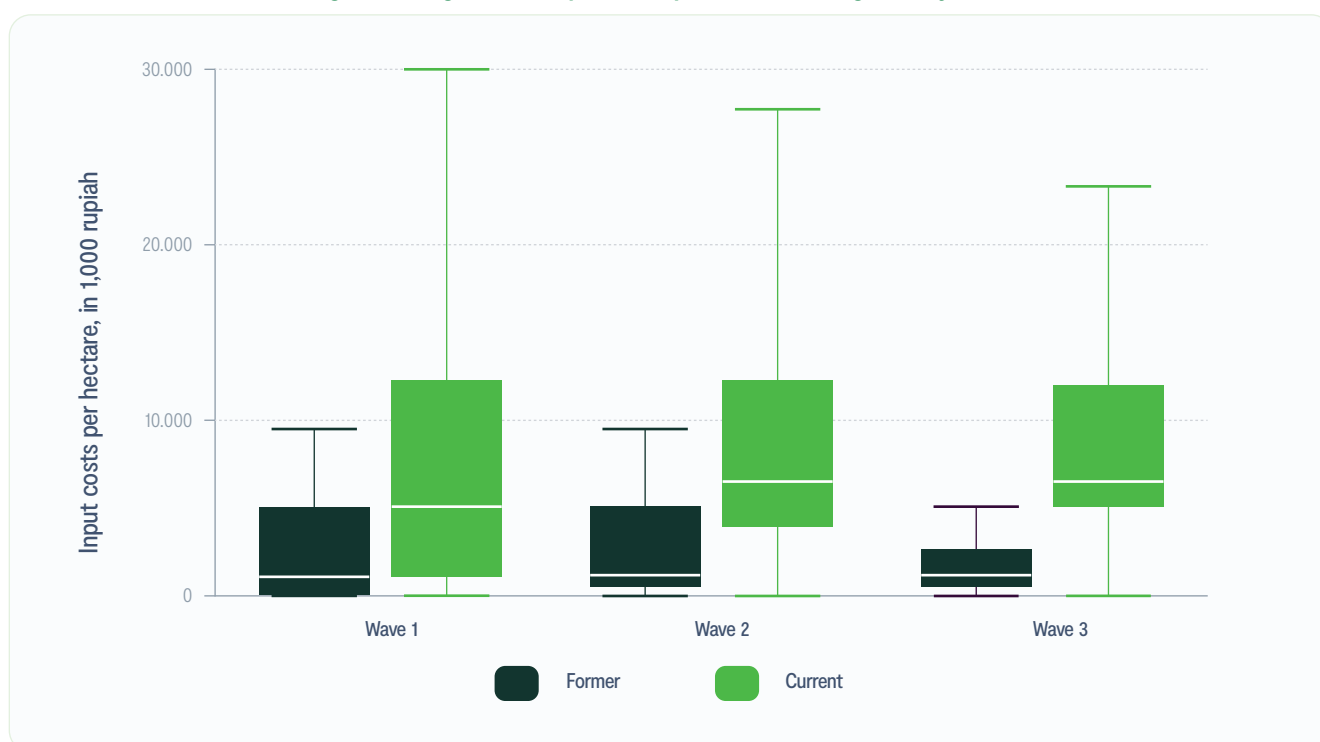
Input	Dry Season		Wet Season	
	Proportion of Farmers Who Used the Item (%)	Average Costs (1,000 IDR)	Proportion of Farmers Who Used the Item (%)	Average Costs (1,000 IDR)
Bamboo, bamboo sticks, rice hay, descale-ride	16.43	.	11.22	.
Knapsack Sprayer	76.81	.	87.32	.
Drums	16.43	.	15.61	.
Sprinkler	48.31	.	32.20	.
Rental of equipment/livestock	45.41	524	69.27	618
Transportation (to market)	51.21	.	51.71	.
Water pump	14.98	.	19.02	.
Mattock, sickle	98.55	.	99.02	.
Others	9.18	1,029	5.85	917
Wave 2				
Fertilizer, non-organic	96.00	604	98.45	832
Fertilizer, organic	56.00	195	56.59	314
Pesticides (chemicals)	72.00	194	82.95	213
Gasoline for clove farming equipment	20.00	386	17.05	313
Oil	10.40	37	9.30	43
Firewood/fuel wood	0.80	.	.	.
Bamboo, bamboo sticks, rice hay, descuke-ride	20.00	.	13.18	.
Knapsack Sprayer	75.20	.	85.27	.
Drums	28.80	.	20.93	.
Sprinkler	55.20	.	32.56	.
Rental of equipment/livestock	41.60	364	54.26	513
Transportation (to market)	67.20	122	69.77	128
Water pump	26.40	.	20.16	.
Mattock, sickle	97.60	.	98.45	.
Others	7.20	502	6.98	425
Wave 3				
Fertilizer, non-organic	97.69	1,124	97.89	1,249
Fertilizer, organic	53.85	319	50.00	332
Pesticides (chemicals)	81.54	284	85.92	290
Gasoline for clove farming equipment	27.69	420	26.76	370
Oil	3.85	97	0.70	18.22
Firewood/fuel wood	0.77	1.8	1.41	113
Bamboo, bamboo sticks, rice hay, descuke-ride	18.46	.	13.38	.
Knapsack Sprayer	83.08	.	85.92	.
Drums	14.62	.	10.56	.
Sprinkler	52.31	.	32.39	.
Rental of equipment/livestock	54.62	482	71.83	764
Transportation (to market)	84.62	279	91.55	240
Water pump	27.69	.	23.24	.
Mattock, sickle	98.46	.	98.59	.
Others	31.54	434	33.10	278

Note: The sample includes tobacco and former tobacco farmers in Central and East Java. The costs in the second and third wave of the survey are adjusted for inflation.

So far, we have discussed total costs of agricultural inputs for both tobacco and non-tobacco growing. We now discuss the total agricultural input costs per hectare to illustrate the magnitude of difference in input costs between tobacco and non-tobacco growing, depicted in Figure 4.2. The figure shows differences in input costs per hectare borne by tobacco and former tobacco farmers across waves. We can observe the stark difference in input

costs per hectare borne by current versus former tobacco farmers. For example, in Wave 3, tobacco farmers spent about Rp6 million per hectare for tobacco crops, while former tobacco farmers spent less than one million rupiah for non-tobacco crops. We also observe an increase in input costs per hectare for tobacco farming across waves. However, input costs per hectare for non-tobacco crops were consistent across waves.

Figure 4-3. Agricultural Input Costs per Hectare during The Dry Season



Note: The sample includes tobacco and former tobacco farmers in Central and East Java. The costs in the second and third wave of the survey are adjusted for inflation.

In the survey, we asked tobacco farmers to estimate the total input costs for tobacco growing. Tobacco farmers' response to this question would be the perceived cost of tobacco farming. We also enumerated each input cost systematically to obtain the actual costs of tobacco farming. In Figure 4.3, we present the learning curves of cost estimation for tobacco farmers, depicting the difference in perceived and actual costs of tobacco farming across years of farming experience. Farmers were grouped based on their years of farming experiences in bins of 5 years. The figure represents the learning curve of costs estimation among tobacco farmers.

Actual agricultural input costs of tobacco farming tend to increase over the years, which is consistent with the trend observed in Figure 4.2. Perceived agricultural input costs for tobacco farming were significantly lower than the actual agricultural input costs. This pattern suggests that farmers tend to underestimate the actual agricultural input costs of tobacco farming, and thus, overestimating their tobacco profits. Remarkably, perceived agricultural input costs for tobacco farming did not increase over time. In fact, perceived agricultural input costs of tobacco farming were lower in Wave 2 than in Wave 1 and Wave 3.

Figure 4-4. Learning Curve of Agricultural Input Cost Estimation for Tobacco Farmers



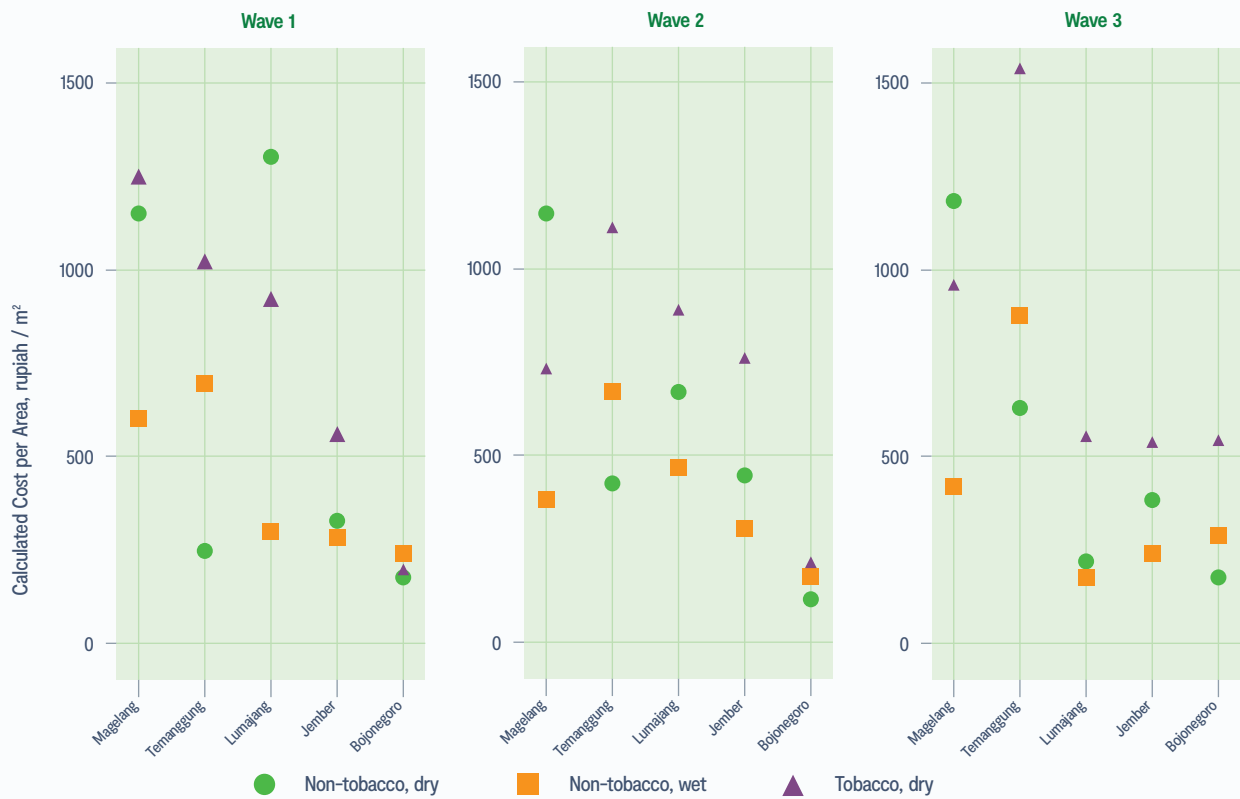
Note: The sample includes tobacco and former tobacco farmers in Central and East Java. The costs in the second and third wave of the survey are adjusted for inflation.

We analyze agricultural input costs per hectare borne by tobacco farmers for tobacco farming in the dry season and non-tobacco farming in both the dry and wet seasons across regions. We depict the analysis in Figure 4.4. Median agricultural input costs for tobacco farmers by region, all seasons. We find variation in input costs per hectare across regions. In Wave 3, we can observe that input costs per hectare were generally lower in East Java (Lumajang, Jember, Bojonegoro) than in Central Java (Magelang and Temanggung). We also find that tobacco farmers generally were spending more for agricultural inputs per hectare for their tobacco crops than for their non-tobacco crops. The pattern is consistent across regions with the exception of

Magelang. Interestingly, the pattern is also consistent across waves.

We also conduct a similar analysis for former tobacco farmers. In Figure 4.5, we depict the analysis of agricultural input costs borne by former tobacco farmers for growing non-tobacco crops in both the dry and wet season. We find variation in input costs borne by former tobacco farmers across regions. In particular, agricultural input costs per hectare were generally lower in East Java than in Central Java. Remarkably, the pattern is quite consistent across years. More importantly, costs borne by former tobacco farmers for growing non-tobacco crops in the dry season were lower than the costs borne by tobacco farmers for tobacco growing.

Figure 4-5. Median Agricultural Input Costs for Tobacco Farmers by Region, All Seasons



Note: The sample includes tobacco and former tobacco farmers in Central and East Java. The costs in the second and third wave of the survey are adjusted for inflation.

Figure 4-6. Median Agricultural Input Costs for Former Tobacco Farmers by Region, All Seasons



Note: The sample includes tobacco and former tobacco farmers in Central and East Java. The costs in the second and third wave of the survey are adjusted for inflation.

Labor is an important input in tobacco and non-tobacco farming. We analyze median hours worked by farming household members during the dry season in Table 4.11. In general, male household members tend to spend longer hours for both tobacco and non-tobacco farming. We find that tobacco farming is much more labor-intensive than non-tobacco farming. In Wave 3, male household members spent a median 240 hours for tobacco farming, but they only spent 90 hours for non-tobacco farming. The same pattern also holds for female members of tobacco households. Male and female members of tobacco households also spent more

time for tobacco farming than male and female members of former tobacco households for non-tobacco farming.

It is interesting to note that median hours worked for tobacco farming were generally lower in Wave 2 and Wave 3 than in Wave 1. A potential explanation is that tobacco farmers experienced a “wet” dry season, and they might have needed more time to tend their tobacco. It is also important to note that tobacco farming households employ children—both male and female—below the age of 15.

Table 4-12. Median Hours Worked by Farming Household Members by Gender, Age, and Tobacco-nontobacco Crops (tobacco/dry season)

	Current: Tobacco		Current: Non-tobacco		Former: Non-tobacco	
	Male	Female	Male	Female	Male	Female
Wave 1						
<15	35	39	3.5	8	-	-
15-20	120	92	100	30	30	3.5
21-35	540	288	180	120	220	78
36-60	640	450	276	144	418	170
>60	612	450	240	60	383	225
All	600	360	240	120	360	145
Wave 2						
<15	-	-	-	-	-	-
15-20	6	540	17	112	11	-
21-35	240	135	32	34	158	60
36-60	300	225	160	75	150	80
>60	575	300	125	54	168	128
All	279	180	93	65	120	90
Wave 3						
<15	44	30	16	9	4	-
15-20	48	45	15	15	32	33
21-35	240	93	120	60	78	34
36-60	360	150	120	82	135	72
>60	592	276	80	69	144	26
All	240	123	90	60	90	50

Note: The sample includes tobacco and former tobacco farmers in Central and East Java.

Tobacco farming households commonly hired labor for nursery, land preparation, field tending, harvest, and marketing. These labors are typically hired by the day and not hours. In Table 4.12, we report the analysis of average days spent by hired labor for different activities. In general, hired male labors tend to work more days than hired female labors. Similar with the pattern observed among household members,

hired labors worked fewer days in Wave 2 and Wave 3 than in Wave 1. Activities that required more hired labor days were field tending, harvest, and post-harvest. It is important to note that tobacco farming households also hired children. In Wave 3, tobacco farming households hired children for both harvest and post-harvest activities.

Table 4-13. Hired Labor for Tobacco Farming by Gender, Adult & Child – Average Number of Days

Worker Type	Wave 1			Wave 2			Wave 3		
	Adult Male	Adult Female	Child	Adult Male	Adult Female	Child	Adult Male	Adult Female	Child
Nursery	5.71	5.10	-	8.32	5.26	-	4.43	4.00	-
Land preparation	7.56	6.39	-	6.21	15.18	-	6.33	5.89	-
Field tending	14.00	13.69	-	9.82	7.27	-	10.18	6.86	-
Harvest	10.27	12.05	-	7.04	7.85	-	8.70	9.19	12.00
Post-harvest	9.66	9.95	1.60	8.34	7.84	2.40	11.41	8.68	5.00
Marketing	2.21	1.33	-	3.52	4.33	-	5.29	9.00	-

Note: The sample includes tobacco and former tobacco farmers in Central and East Java.

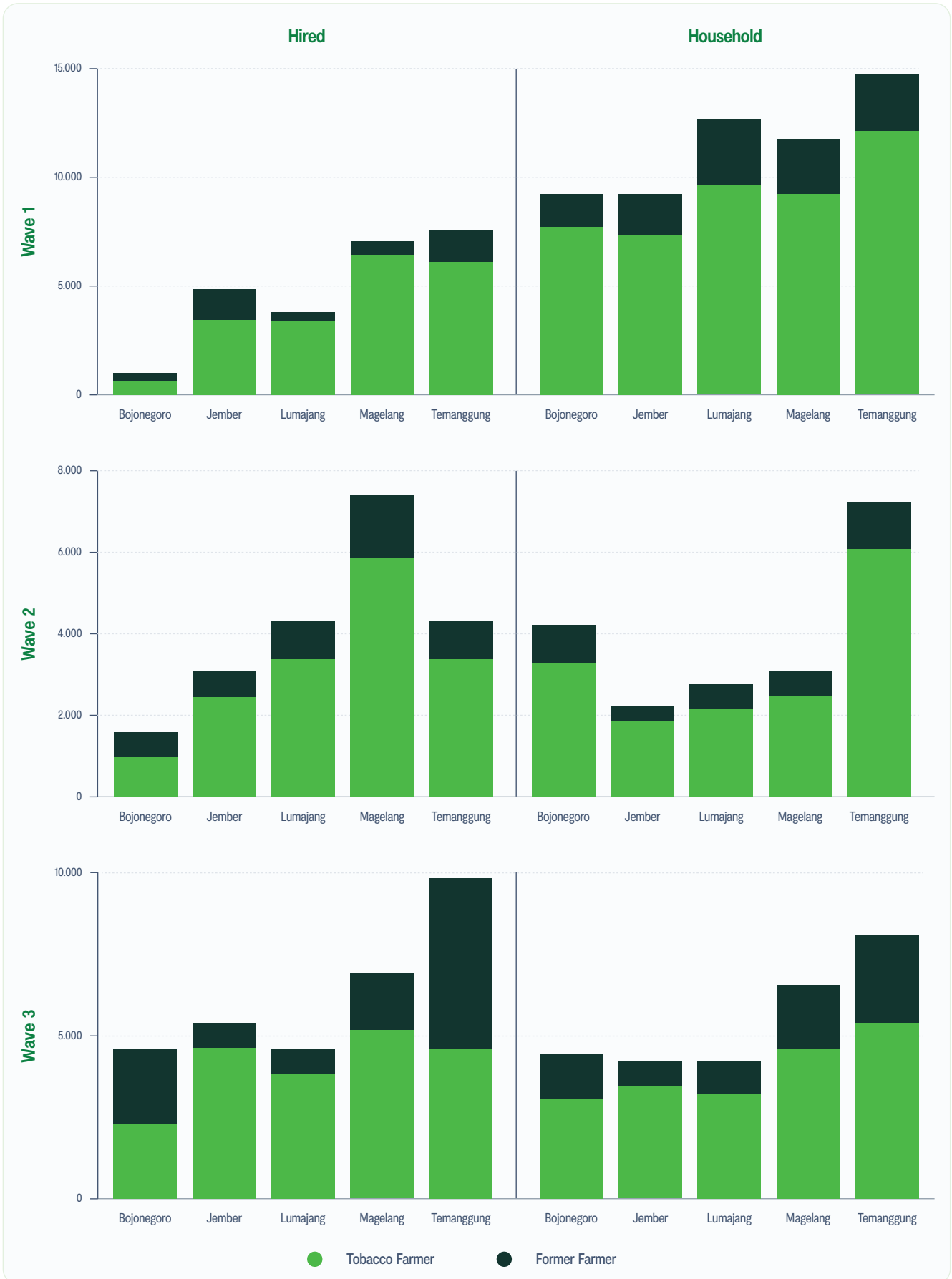
So far, we have explored time spent by household and hired labor for tobacco and non-tobacco farming. We report analysis of median labor costs—for both household and hired labors—in both seasons across regions in Figure 4.7. The median household and hired labor costs borne by tobacco farmers for tobacco farming were significantly higher than labor costs for non-tobacco farming. In Wave 3, median household and hired labor costs for tobacco farming were twice the costs of labor costs for nontobacco farming.

Tobacco farmers also spent more on labor costs than former tobacco crops. Notably, too, the costs of household labor borne by tobacco households were significantly larger than household labor borne by non-tobacco households. In Wave 3, the median household labor costs for tobacco farming were Rp2.266 million while the median household labor

costs for non-tobacco farming was Rp697,000. There were also variations in hired and household labor costs across regions. Hired and household labor costs were generally higher in Central Java (Magelang and Temanggung) than in East Java.

There were also interesting variations across years. Among tobacco growing households, hired labor costs tend to increase for both tobacco and non-tobacco farming. Household labor costs borne by tobacco growing households were significantly lower in Wave 2 and Wave 3 than in Wave 1. Among former tobacco households, hired labor costs were higher in Wave 3 than in Wave 2. On the other hand, household labor costs were lower in Wave 3 than in the previous two waves. The main explanation for the lower household labor costs is that household members spent fewer hours on farming activities.

Figure 4-7. Median Household and Hired Labor Costs (1,000 IDR) for Current and Former Tobacco Farmers, by Regions

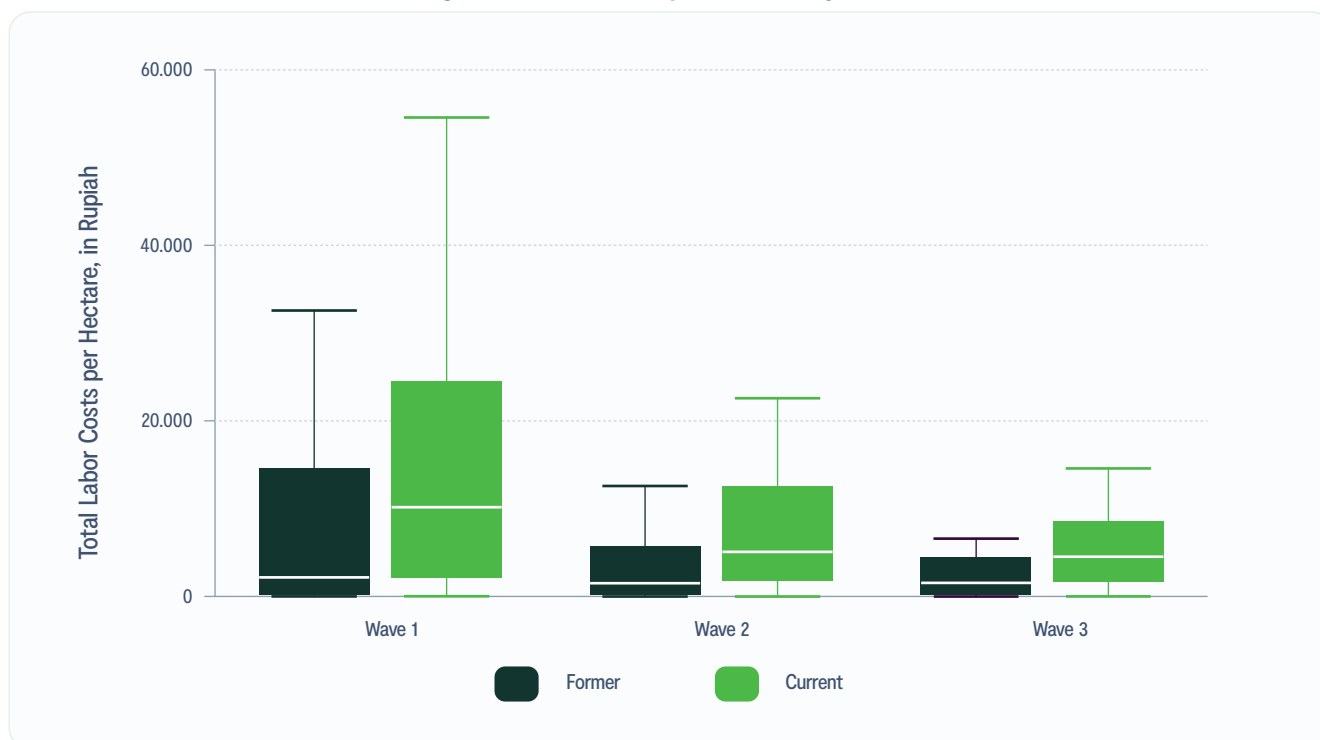


Notes: The sample includes tobacco and former tobacco farmers in Central and East Java. The costs in the second and third wave are adjusted for inflation.

We analyze the difference in total labor costs borne by current and former tobacco farmers. We depict the analysis in Figure 4.6. Tobacco farmers consistently bore higher labor costs per hectare

across waves, particularly in Wave 1. Labor costs borne by tobacco farmers were trending downward across waves, but they are still lower than labor costs borne by former tobacco farmers.

Figure 4-8. Labor Costs per Hectare, Dry Season



Note: The sample includes tobacco and former tobacco farmers in Central and East Java. The costs in the second and third wave are adjusted for inflation. Outside values were not shown.

4.3. Profits

We analyze median agricultural profits per hectare for tobacco farmers and former tobacco farmers in the dry season. Real tobacco profit is defined as tobacco sales minus tobacco farming non-household labor input costs and tobacco farming household labor costs, while perceived tobacco profit is tobacco sales less tobacco farming input costs. Per-hectare profit is profit divided by total cultivated land for tobacco farming in the dry season. We report the results of the analysis in Table 4.14.

Tobacco farmers generally plant both tobacco and non-tobacco crops during the dry season. Economic profits from tobacco farming were generally higher in Wave 2 and Wave 3 than in Wave 1.

In wave 1, a typical tobacco farmer experienced a significant loss. In contrast, a typical tobacco farmer made a profit of about Rp6 and Rp4 millions in Wave 2 and Wave 3, respectively. The main explanations for the dynamics were changes in volume of tobacco leaf sold and prices. Volume of tobacco leaf sold, and prices were significantly higher in Wave 2 than in Wave 1. While volume of tobacco leaf sold were higher in Wave 3 than in Wave 2, prices were still higher in Wave 2. It is important to note that for a typical tobacco farmer economic profits gained in Wave 2 and Wave 3 combined were still lower than losses experienced in Wave 1.

We analyze the difference in total labor costs borne by current and former tobacco farmers. We depict the analysis in Figure 4.6. Tobacco farmers consistently bore higher labor costs per hectare

across waves, particularly in Wave 1. Labor costs borne by tobacco farmers were trending downward across waves, but they are still lower than labor costs borne by former tobacco farmers.

Table 4-14. Median Agricultural Profits per hectare (1,000 rupiah)—Former and Current Tobacco Farmers—in The Dry Season

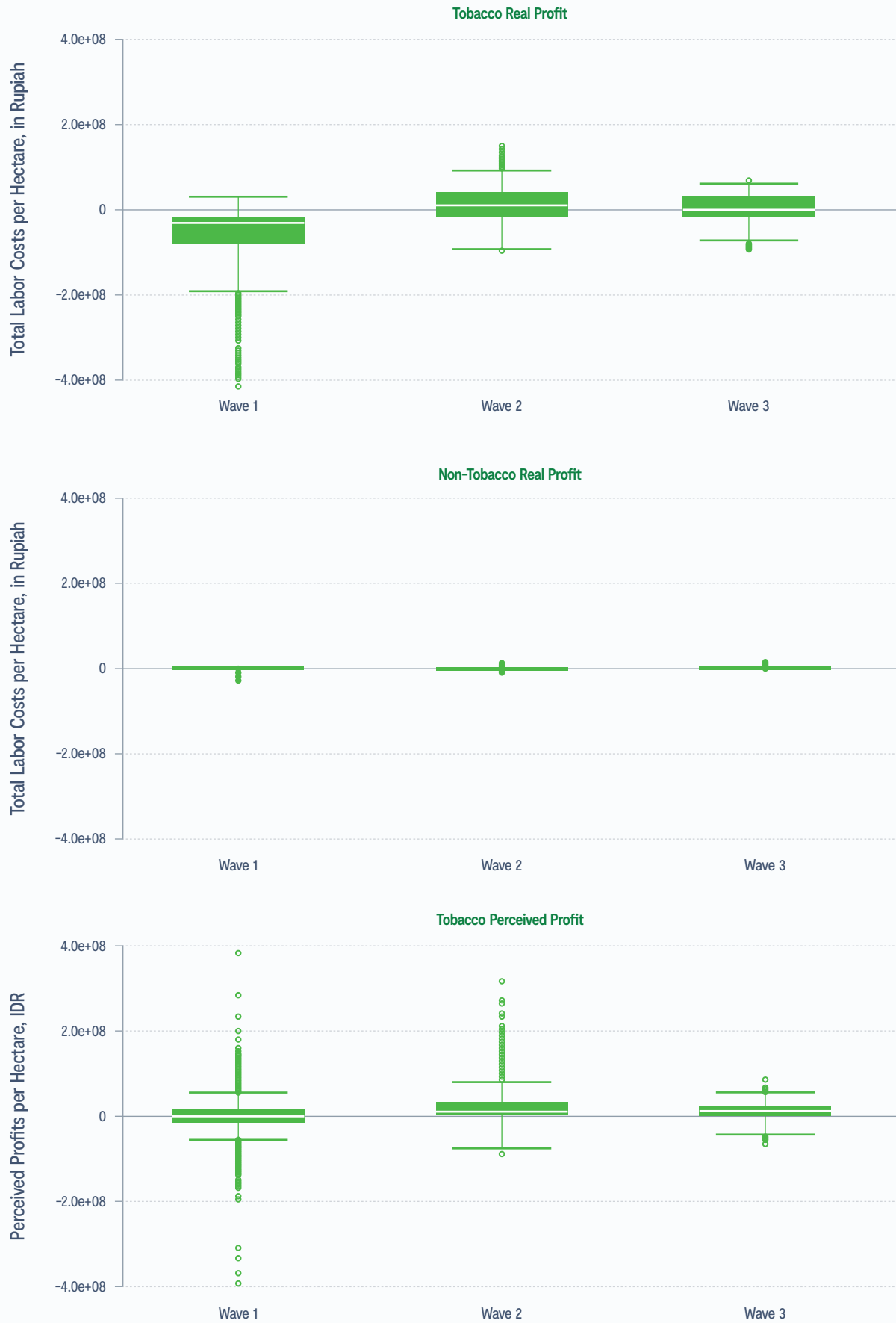
	Tobacco Farming		Non-tobacco Farming	
	Real	Perceived	Real	Perceived
Wave 1				
Current	-25,423	-679	-8,767	5,284
Former	.	.	-7,824	3,515
Wave 2				
Current	5,966	17,195	2.85	5,308
Former	.	.	-508	4,970
Wave 3				
Current	4,095	14,154	3,177	8,719
Former	.	.	4,958	8,291

Note: The sample includes tobacco and former tobacco farmers in Central and East Java. Profits in the second and third wave are adjusted for inflation.

There were differences in the distributions of economic profit per hectare across waves. In Figure 3.1, We depict distributions of real and perceived profits of tobacco and non-tobacco farming in the dry season. It is quite straightforward to observe that real profits from tobacco farming were better in Wave 2 and Wave 3 than in Wave 1. It is interesting to observe that the variance in the distribution of real tobacco

profit is smaller than the variance in the distribution of perceived tobacco profit. This suggests that many tobacco farmers were expecting profits in Wave and Wave 3. It is also important to observe that the variance of economic profits from non-tobacco farming was actually quite small compared to the variance of profits from non-tobacco farming.

Figure 4-9. Distribution of Economic Profit per Hectare of Tobacco and Non-tobacco Farming Among Tobacco Farmers (IDR)





Note: The sample includes tobacco and former tobacco farmers in Central and East Java. Real tobacco profit is tobacco sales minus tobacco farming non-household labor input costs and tobacco farming household labor costs, while perceived tobacco profit is tobacco sales less tobacco farming non-labor input costs. Real non-tobacco profit is non-tobacco sales minus non-tobacco farming input costs and non-tobacco farming household labor costs, while perceived tobacco profit is non-tobacco sales less non-tobacco farming input costs. Per-hectare profit is profit divided by total cultivated land for tobacco farming in the dry season. Profits in the second and third wave are adjusted for inflation. For each wave, we drop observations with total household income lower than the 5th and higher than the 95th percentiles

We further analyze economic profits from tobacco and non-tobacco farming across regions. We report the median profits for tobacco farmers in Figure 4.10 and the detailed analysis for tobacco and non-tobacco farmers across regions in Table 4.15. As discussed previously, tobacco farming profits were generally better in Wave 2 and Wave 3 than in Wave 1. However, we also observe variation across regions. In Wave 3, tobacco farmers in Jember and Lumajang enjoyed higher profits than tobacco farmers in other regions. In contrast, tobacco farmers in Magelang

consistently experienced losses across waves, although the loss was lower in Wave 3.

Wave 3 was also a good year for non-tobacco farming particularly in Bojonegoro, Jember, and Temanggung. It is important to note that tobacco farmers in Magelang also consistently experienced losses from non-tobacco farming. This could be partly due to the relatively high costs of labor that tobacco farmers in Magelang had to bear for non-tobacco and particularly tobacco farming.

Figure 4-10. Median Profit (1,000 IDR) per Hectare for Current Tobacco Farmers by Region (tobacco/dry season)

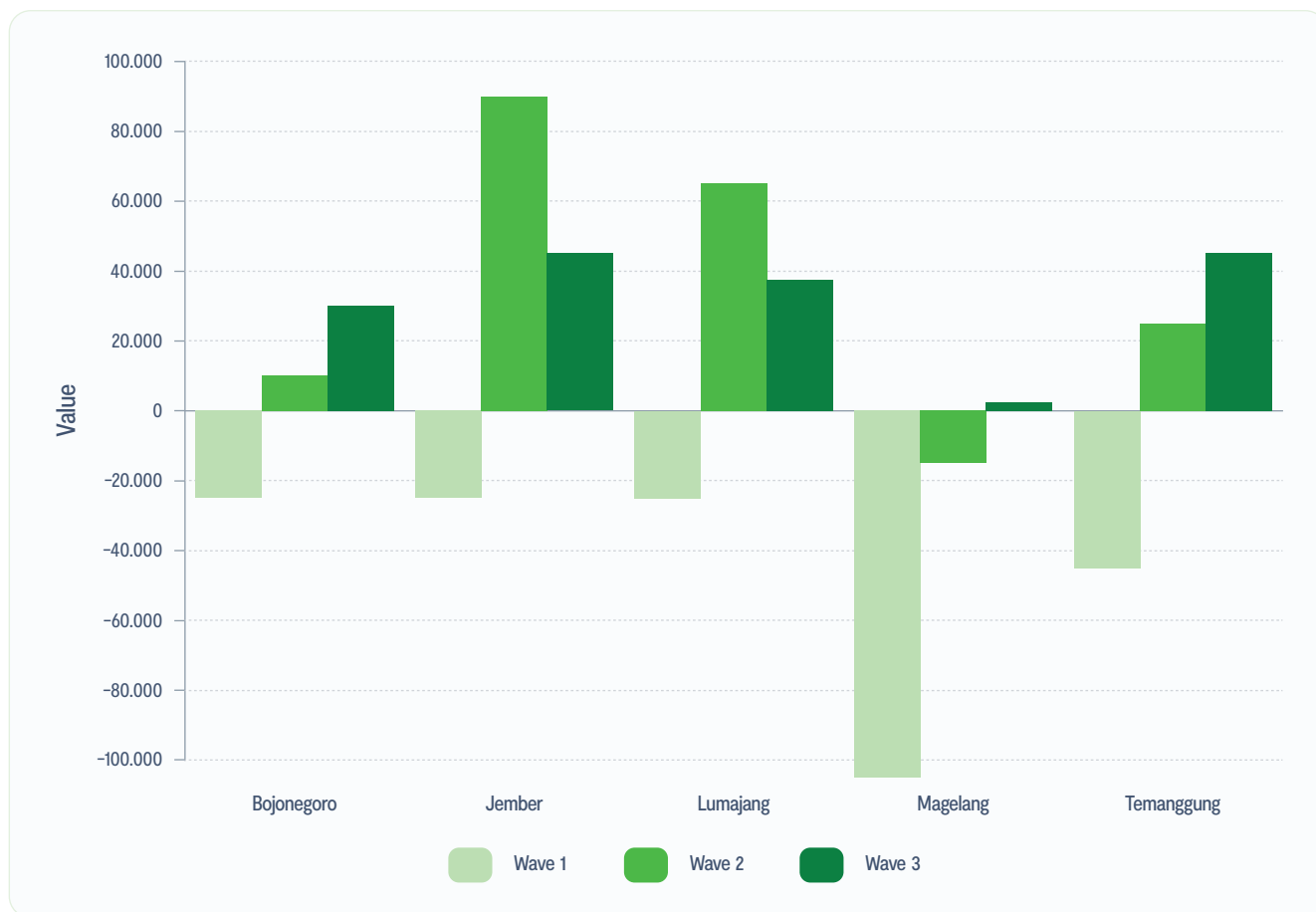


Table 4-15. Median Profit (1,000 IDR) per Hectare for Current Tobacco Farmers by Region (tobacco/dry season)

Region	Tobacco: Real Profit			Tobacco: Perceived Profit		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
Bojonegoro	-22,792	329	2,783	-22,792	329	2,783
Jember	-22,749	30,694	10,788	-22,749	30,694	10,788
Lumajang	-25,371	20,533	12,665	-25,371	20,533	12,665
Magelang	-72,608	-10,489	-4,951	-72,608	-10,489	-4,951
Temanggung	-22,425	6,269	2,333	-22,425	6,269	2,333
Total	-25,423	5,966	4,095	-25,423	5,966	4,095
Region	Non-Tobacco: Real Profit			Non-Tobacco: Perceived Profit		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
Bojonegoro	-8,092	-89	6,079	6,000	3,490	11,031
Jember	-4,743	5,854	6,374	2,920	11,176	9,654
Lumajang	-7,337	3,919	2,215	5,660	6,640	2,939
Magelang	-43,247	-12,726	-10,873	11,944	2,403	8,714
Temanggung	-28,492	-10,051	5,253	6,403	10,037	21,386
Total	-8,767	2.85	3,177	5,284	5,308	8,719

Note: The sample includes tobacco and former tobacco farmers in Central and East Java. Real tobacco profit is tobacco sales minus tobacco farming non-household labor input costs and tobacco farming household labor costs, while perceived tobacco profit is tobacco sales less tobacco farming non-household labor input costs. Real non-tobacco profit is non-tobacco sales minus non-tobacco farming input costs and non-tobacco farming household labor costs, while perceived tobacco profit is non-tobacco sales less non-tobacco farming input costs. Per-hectare tobacco profit is profit divided by total cultivated land for tobacco farming in the dry season. Per-hectare non-tobacco profit is profit divided by total cultivated land for non-tobacco farming in the dry season Profits in the second and third wave are adjusted for inflation.

We also analyze economic profits of independent and contract tobacco farmers by region (see Table 4.16). Contract tobacco farmers consistently fare better than independent tobacco farmers across waves. Contract tobacco farmers made even higher profits in Wave 3 than in Wave 2, while independent tobacco farmers experienced lower profits in Wave 3.

Contract tobacco farmers in Temanggung made higher profits relative to contract tobacco farmers in other regions. Profits made by contract farmers in Temanggung stand in contrast with profits made by independent farmers. Independent tobacco farmers who made sizable profits in Wave 3 were those in Jember and Lumajang.

Table 4-16. Median Profits per Hectare (1,000 IDR) – Independent and Contract Tobacco Farmers, by Region (tobacco/dry season)

Region	Contract: Real Profit (tobacco + non-tobacco)			Contract: Perceived Profit (tobacco + non-tobacco)		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
Bojonegoro	-12,611	8,727	6,916	4,953	13,736	9,198
Jember	-11,841	13,419	10,492	-3,636	18,482	23,656
Lumajang	-23,879	14,258	17,984	995	21,649	21,960
Magelang	-73,388	-24,680	.	56,277	741	-2,105
Temanggung	-25,241	13,078	60,670	-19,764	17,541	66,083
Total	-16,847	10,301	11,317	896	17,711	19,138
Region	Independent: Real Profit (tobacco + non-tobacco)			Independent: Perceived Profit (tobacco + non-tobacco)		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
Bojonegoro	-20,875	-495	3,628	1,125	6,391	11,427
Jember	-21,927	29,242	10,616	1,405	38,328	16,103
Lumajang	-21,928	13,122	8,377	7,966	34,940	13,929
Magelang	-75,555	-6,911	-7,074	-2,105	6,552	7,929
Temanggung	-21,956	4,240	2,027	20	19,382	14,141
Total	-24,817	4,036	3,368	211	15,307	13,046

Note: The sample includes tobacco and former tobacco farmers in Central and East Java. There were only 2 contract tobacco farmers in Magelang. Real profit is real tobacco plus real non-tobacco farming profits, while perceived profit is perceived tobacco and non-tobacco farming profits. Per-hectare profit is profit divided by total cultivated land for tobacco and non-tobacco farming in the dry season. Profits in the second and third wave are adjusted for inflation.

We also analyze economic profits per kilogram of tobacco, presented in Table 4.17. Analysis of profits per kilogram is a more informative metric of profitability because most tobacco farmers typically cultivate small plots of land. Tobacco farmers in Lumajang enjoyed another good year in Wave 3. A typical tobacco farmer in Lumajang made a sizable profit of Rp10,424/kg. Tobacco farmers in Bojonegoro also experienced higher profits per kilogram in Wave 3 than in Wave 2. While still making a reasonable profit per kilogram, a typical Jember tobacco farmer's profit was lower by almost Rp10,000/kg in Wave 3. Similar to patterns observed in previous analyses, tobacco

farmers in Magelang consistently made losses per kilogram of tobacco sold.

Non-tobacco profits per kilogram also varied. Tobacco farmers in Bojonegoro, Jember, and Temanggung made modest profits per kilogram of non-tobacco crops in Wave 3. Although Lumajang tobacco farmers made significant tobacco profit, their profits from non-tobacco crops were relatively small. Note that we should exercise caution when interpreting tobacco profit per kilogram across regions as composition of non-tobacco crops vary across regions.

Table 4-17. Current Tobacco Farmer Median Profits per Kilogram (IDR rupiah) by Region

Region	Tobacco: Real Profit			Tobacco: Perceived Profit		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
Bojonegoro	-18,742	98	566	593	2,670	2,104
Jember	-23,378	16,070	6,360	1,199	22,295	10,800
Lumajang	-23,940	9,657	10,424	2,681	17,423	15,074
Magelang	-11,342	-2,990	-2,308	-284	1,051	1,370
Temanggung	-10,545	1,353	1,450	69	7,348	9,636
Total	-17,921	1,875	1,371	343	9,211	5,580

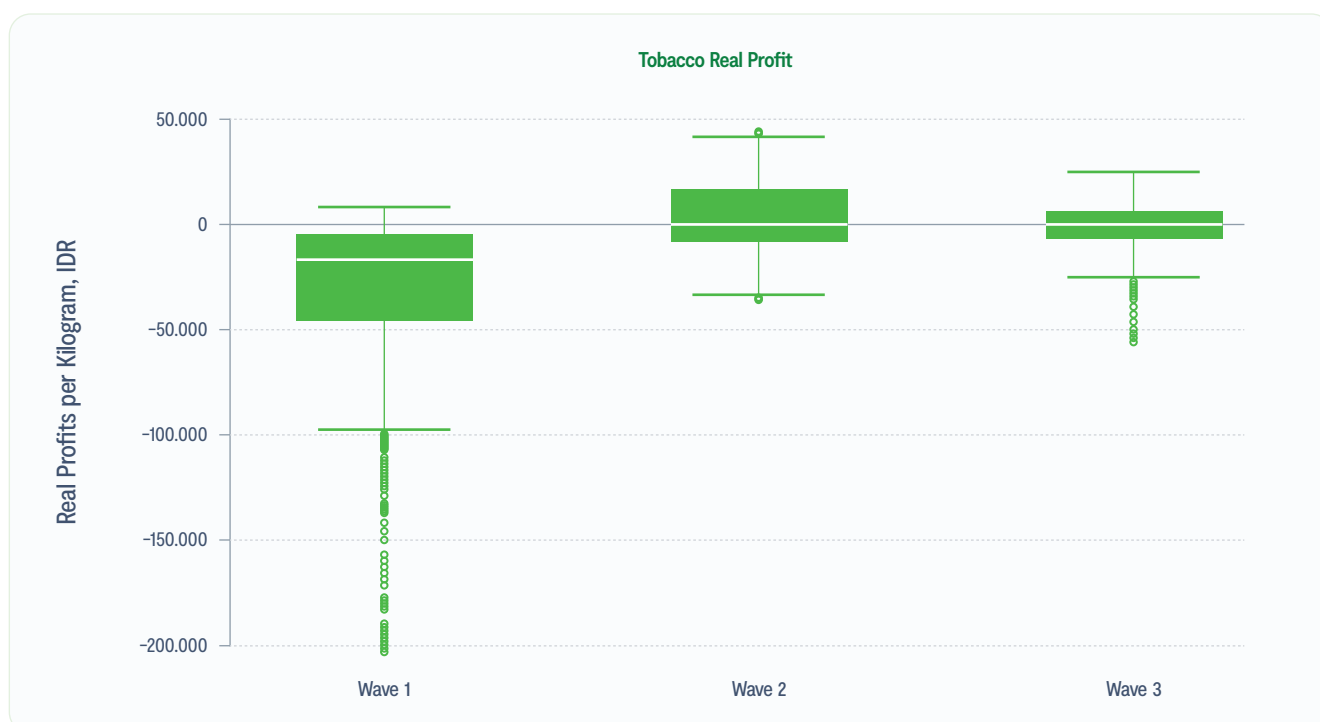
Region	Non-tobacco: Real Profit			Non-tobacco: Perceived Profit		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
Bojonegoro	-9,449	-189	3,290	2,733	2,516	4,348
Jember	-2,257	74	1,259	655	816	2,129
Lumajang	-2,703	330	592	763	624	1,190
Magelang	-4,862	-1,927	-723	666	500	1,508
Temanggung	-15,087	-3,183	1,038	4,000	3,132	4,969
Total	-5,354	-150	907	1,220	1,418	2,467

Note: The sample includes tobacco and former tobacco farmers in Central and East Java. Per-kilogram tobacco profit is profit divided by total tobacco yield, while per-kilogram non-tobacco profit is profit divided by total non-tobacco yield. Profits in the second and third wave are adjusted for inflation.

In Figure 4.8, we depict the distribution of real and perceived profits per kilogram of tobacco sold. Distributions of perceived tobacco profit is generally wider than distributions of real profit. Wave 3 was

generally a good year for tobacco farming. However, there were more tobacco farmers who experienced losses in Wave 3 than in Wave 2.

Figure 4-11. Distribution of Profits per Kilogram for Current Tobacco Farmers





Note: The sample is restricted to households who were observed in three survey waves. Per-kilogram tobacco profit is profit divided by total tobacco yield, while per-kilogram non-tobacco profit is profit divided by total non-tobacco yield. Profits in the second and third wave are adjusted for inflation.



4.4. Loans for Tobacco Farming

We analyze reasons reported by farmers for needing loans, presented in Table 4.18. In Wave 3, about a quarter of tobacco farmers needed loans to finance inputs for tobacco farming. Approximately 15 percent of tobacco farmers needed loans to finance inputs for farming non-tobacco crops. It is important to note that in Wave 3 tobacco and non-tobacco

farmers reported needing loans to cover basic household expenses. There was a larger share of former tobacco farmers who reported needing loans for investing in business. This finding is in line with previous analysis that find former tobacco farmers have more diverse income sources than tobacco farmers.

Table 4-18. Reasons Reported for Needing Loans

	Wave 1		Current Wave 2		Wave 3		Wave 1		Former Wave 2		Wave 3	
	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
Inputs for tobacco farming	230	35.99	137	29.59	115	29.59	10	6.45	3	2.75	1	0.64
Land for tobacco farming	31	4.85	33	7.13	26	7.13	3	1.94	8	7.34	1	0.64
Inputs for farming other crops	115	18.00	59	12.74	66	12.74	37	23.87	22	20.18	30	19.23
Land for farming other crops	12	1.88	6	1.3	1	1.3	4	2.58	3	2.75	3	1.92
Schooling	37	5.79	29	6.26	37	6.26	10	6.45	8	7.34	7	4.49
Purchasing house	7	1.10	11	2.38	15	2.38	5	3.23	1	0.92	3	1.92
Purchasing vehicle	7	1.10	9	1.94	8	1.94	3	1.94	3	2.75	10	6.41
Investing in business	33	5.16	31	6.7	36	6.7	22	14.19	19	17.43	24	15.38
Special occasions	27	4.23	27	5.83	30	5.83	14	9.03	12	11.01	7	4.49
Meeting daily needs	108	16.90	80	17.28	86	17.28	39	25.16	20	18.35	57	36.54
Health expenses	20	3.13	12	2.59	9	2.59	7	4.52	4	3.67	5	3.21
Other	12	1.88	29	6.26	16	6.26	1	0.65	6	5.5	8	5.13
Total	639	100	463	100	445	100	155	100	109	100	156	100

Note: The sample includes tobacco and former tobacco farmers in Central and East Java.

4.5. Other Crop Growing

We observe a quite diverse farming portfolio in both the dry and wet seasons. In Table 4.19, we report the analysis of crops grown to sell by tobacco and former tobacco farmers in both seasons. Paddy, corn, chili, and other vegetables are among the most common crops grown to sell in both seasons, although there is an interesting seasonal pattern that is

consistent across waves. Specifically, in the wet season, almost half of tobacco and former tobacco farmers grew paddy. In the dry season, tobacco and former tobacco farmers tend to grow corn or chili. Other commonly grown crops are cashew or other nuts, green vegetables, and cassava.

Table 4-19. Proportion of a Crop Grown to Sell (in percentage)

	Dry Season		Wet Season	
	Current	Former	Current	Former
Wave 1				
Cassava	5.45	3.67	2.58	3.7
Potato	0.64	0.82	0.00	0.00
Ground nut	1.92	1.63	0.86	1.85
Cashew or other nuts	7.05	4.08	6.88	5.09
Soybean	1.6	2.04	1.23	0.46
Corn	31.09	29.39	15.60	12.96
Chili	37.5	22.45	17.44	10.65
Shallot	0.00	0.00	2.95	0.46
Coconut	0.00	0.41	0.00	0.00
Banana	1.6	0.41	0.12	0.00
Green vegetables	4.17	7.76	5.9	4.17
Other vegetables	4.49	8.57	3.19	5.09
Clove	0.32	0.00	0.00	0.00
Paddy	3.53	13.88	43.12	53.70
Other fruits	0.64	4.90	0.12	1.85
Wave 2				
Cassava	2.77	3.85	1.49	2.60
Potato	0.00	0.00	0.00	0.00
Ground nut	2.15	2.20	1.65	1.30
Cashew or other nuts	7.08	2.75	3.63	6.49
Soybean	0.92	1.10	0.33	0.00
Corn	28.00	39.01	15.02	21.43
Chili	33.54	23.63	18.81	8.44
Shallot	0.62	1.10	2.31	0.65
Coconut	0.31	0.00	0.17	0.00
Banana	0.31	1.10	0.17	0.00
Green vegetables	4.92	3.30	4.79	3.90
Other vegetables	11.08	9.34	10.23	8.44
Clove	0.00	0.00	0.17	0.00
Paddy	6.77	9.89	40.43	45.45
Other fruits	1.54	2.75	0.83	1.30
Wave 3				
Cassava	5.84	3.83	1.54	1.18
Potato	0.00	00.00	0.00	0.00
Ground nut	1.46	1.09	0.68	2.35
Cashew or other nuts	3.28	0.00	7.69	4.12
Soybean	0.36	0.00	0.00	0.59
Corn	29.20	44.81	17.95	24.71
Chili	38.32	18.03	16.24	9.41
Shallot	1.09	0.55	3.76	1.18
Coconut	0.36	0.00	0.17	0.00
Banana	0.36	0.00	0.00	0.59
Green vegetables	4.38	5.46	3.08	2.35
Other vegetables	6.20	12.02	5.81	8.24
Clove	0.36	0.00	0.00	0.00
Paddy	5.84	8.74	41.71	42.35
Other fruits	2.92	5.46	1.37	2.94

Note: The sample includes tobacco and former tobacco farmers in Central and East Java.

While there is variation across regions and seasons, former tobacco farmers generally obtained better sales in chili. In Table 4.20, we present results of analysis of extra sales generated by former tobacco farmers compared with current farmers in Wave 3. A positive number implies that former tobacco farmers generated higher sales than tobacco farmers, while a negative number implies the opposite. In the dry season, former tobacco farmers generated higher sales from chili in all regions. In Temanggung, the extra

sales generated from chili were quite high at Rp40 millions. Former tobacco farmers in Magelang and Temanggung did better in terms of sales from corn, while the opposite is true among tobacco farmers in Temanggung and Jember. In the wet season, paddy, corn, and chilies are the top three crops grown to be sold. Former tobacco farmers in Lumajang and Jember generally did better in terms of sales from corn and chili. Former tobacco farmers in Jember also gained higher sales from paddy than tobacco farmers.

Table 4-20. Average Extra Sales (USD) Generated by Former Tobacco Farmers (compared with current farmers) in Wave 3

	Magelang	Temanggung	Lumajang	Jember	Bojonegoro
Dry Season					
1. Cassava	387,500	100,000	-2,250,000	-148,000	340,000
2. Ground nut	-33,000	-	700,000	-224,000	675,000
3. Cashew nut or another nut	-	-648,500	-50,000	-364,000	-125,000
4. Soybean	-875,000	-	-	-	-
5. Corn	3,362,500	-2,800,000	2,105,000	-1,505,000	465,000
6. Chili	1,440,000	40,000,000	8,650,000	5,405,000	300,000
7. Shallot	-500,000	-10,792,000	-	-	14,500,000
8. Coconut	-	-	-2,800,000	-	-
9. Banana	-50,000	-	-	-	-
10. Green vegetables	408,000	-1,800,000	-4,850,000	70,000	-250,000
11. Other vegetables	-250,000	-750,000	3,450,000	-1,074,500	-1,820,000
12. Clove	-	-7,000,000	-	-	-
13. Paddy	-	-	-3,600,000	-8,250,000	-3,900,000
14. other fruits	-	-	-2,250,000	-150,000	-
Wet Season					
1. Cassava	730,000	-	-	-	-300,000
2. Ground nut	-	-350,000	-240,000	-	4,612,500
3. Cashew nut or another nut	-	-540,000	2,000,000	600,000	-620,000
4. Soybean	-	-	-	-	250,000
5. Corn	-247,750	-1,200,000	3,150,000	1,090,000	250,000
6. Chili	-1,550,000	-8,425,000	1,546,500	17,130,000	-450,000
7. Shallot	-900,000	-1,498,000	-	-	-10,000,000
8. Coconut	-	-	-2,400,000	-	-
9. Banana	260,000	-	-	-	-
10. Green vegetables	1,300,000	-485,000	-3,000,000	-312,000	-
11. Other vegetables	700,000	1,860,000	7,750,000	-3,450,000	-375,000
12. Clove	-	-	-	-	-
13. Paddy	-	-800,000	-304,000	10,450,000	-2,800,000
14. other fruits	-	-	-10,643,000	-315,000	-

Note: The sample includes tobacco and former tobacco farmers in Central and East Java.

A previous study finds that farmers' decision to continue or to shift from tobacco involves several considerations. Recent research finds that profitability, weather, access to credit, education on agriculture, and information are some of the main factors affecting decisions to farm tobacco (Sahadewo, Drope, Li, Witoelar, et al. 2020). We present further evidence on reasons given by tobacco farmers for willingness to shift from tobacco, and we report the analysis in Table 4.21. Consistently across waves, low price is the main cited reason for their willingness to shift from tobacco.

In Wave 3, about 15 percent of tobacco farmers mentioned an inability to sell their crop as one of the main reasons. It is interesting to note that the share of farmers who mentioned more attractive alternatives increased over time. In Wave 3, almost a third mentioned that having more attractive alternatives is a reason for shifting. As in Wave 2, other important reasons given by farmers were weather, particularly rain, as it would affect the quality of tobacco leaf and eventually prices (Sahadewo, Drope, Kartaadipoetra, et al. 2020).

Table 4-21. Reasons Given by Tobacco Farmers for Willingness to Shift from Tobacco

	Wave 1		Wave 2		Wave 3	
	N	Percent	N	Percent	N	Percent
Low price	70	27.45	64	46.38	50	32.68
unfair grading	5	1.96	10	7.25	10	6.54
inability to sell crop	25	9.80	24	17.39	23	15.03
more attractive alternatives	28	10.98	27	19.57	49	32.03
effect on land	22	8.63	2	1.45	5	3.27
relationship with contracting company	2	0.78	5	3.62	12	7.84
extension services	-	-	-	-	-	-
other	128	50.20	75	54.35	74	48.37

Note: The sample includes only Wave 3 tobacco and former tobacco farmers in Central and East Java.

We conducted an econometric analysis to investigate tobacco farmer's willingness to switch away from tobacco. As in the previous wave report, we specify a logistic regression model given that tobacco farmer's willingness is a binary variable (Sahadewo, Drope, Kartaadipoetra, et al. 2020). Specifically:

$$P(\text{willing}_{it}) = \beta_0 + \beta_1 \text{tobacco}_{it} + \gamma X_{it} + \gamma_s + \alpha_i + u_{it},$$

Equation 2

where tobacco indicates the share of a household's land for tobacco farming. As in specification (1), the vector X includes household characteristics such as log of total cultivation area, log of labor hours, log of assets, log of agriculture wage, log of non-agriculture wage, an indicator of whether farmers enter a contract, demographics, district dummies, and wave dummies. We report the average marginal effects in Table 4.22.

We find that tobacco farmers who dedicated a larger share of land for tobacco farming were associated with a lower willingness to switch away from tobacco farming. This may indicate that tobacco farmers with larger share of land have a higher commitment towards tobacco farming, which may come at a higher investment. We also find that tobacco farmers who owned at least one parcel of land were associated with a lower willingness to switch away. Having more than one parcel of land may allow tobacco farmers to diversify their crop portfolio. Lastly, we find evidence that on average willingness to shift away from tobacco was lower in Wave 3 than in Wave 1. Given findings in previous sections, a sensible explanation is better tobacco volume sold and tobacco prices—and thus higher profits—in Wave 3 than in Wave 1.

Table 4-22. Logistic Regression Analysis of Willingness to Shift to Alternative Crops: Average Marginal Effects

	A: Wave 1	B: Wave 2	C: Wave 3	D: Wave 1-3
HH total asset, in log	0.00345 (0.00351)	0.00513 (0.00659)	0.00792 (0.00919)	0.00440 (0.00269)
HH labor hours, log	-0.00894 (0.0153)	0.0230 (0.0168)	0.00360 (0.00887)	0.00979 (0.00802)
head of HH age	-0.00855* (0.00473)	0.0179 (0.0116)	0.00350 (0.0100)	-0.000109 (0.00467)
head of HH age, squared	0.0000838* (0.0000452)	-0.000175 (0.000108)	-0.0000413 (0.0000900)	-0.000000975 (0.0000450)
HH size	0.00929 (0.00906)	0.0151 (0.0107)	0.00904 (0.0105)	0.0100* (0.00573)
HH years of schooling	0.00341 (0.00381)	0.00551 (0.00526)	0.000389 (0.00568)	0.00379 (0.00266)
HH farming experience	0.00102 (0.00100)	0.00119 (0.00143)	-0.000170 (0.00129)	0.000731 (0.000722)
HH profit per area, PPP	0.000000240 (0.000000479)	0.000000202 (0.00000101)	0.000000393 (0.00000119)	0.000000392 (0.000000378)
agricultural wage, log	-0.000873 (0.000935)	-0.000511 (0.00141)	-0.0000419 (0.00141)	-0.000582 (0.000680)
non-agricultural wage, log	0.00154 (0.00104)	0.00119 (0.00151)	-0.00185 (0.00125)	0.000624 (0.000715)
farming sales, log	-0.000411 (0.00187)	-0.00247 (0.00344)	0.000681 (0.00156)	0.0000856 (0.00112)
non-farming sales, log	0.000934 (0.000812)	0.000445 (0.00112)	0.00103 (0.000973)	0.000846 (0.000563)
total cultivated land, in log	-0.000647 (0.00716)	-0.0150 (0.0214)	0.000140 (0.0118)	-0.00257 (0.00633)
land share, tobacco	-0.00172*** (0.000539)	-0.000715 (0.000839)	-0.000935 (0.000923)	-0.00122*** (0.000431)
1 if contract	0.0270 (0.0315)	-0.0652 (0.0542)	-0.0251 (0.0450)	-0.0105 (0.0223)
1 if owned at least one parcel	-0.0401 (0.0264)	-0.0511 (0.0438)	0 (.)	-0.0446** (0.0214)
1 if Temanggung	0.0134 (0.0506)	0.0543 (0.0500)	-0.0266 (0.0436)	0.0200 (0.0290)
1 if Lumajang	0.0417 (0.0536)	0.0208 (0.0642)	0.0286 (0.0630)	0.0292 (0.0346)
1 if Jember	0.0730 (0.0456)	-0.0186 (0.0584)	0.0198 (0.0448)	0.0306 (0.0286)
1 if Bojonegoro	0.0516 (0.0442)	-0.0345 (0.0559)	-0.141** (0.0671)	-0.00897 (0.0276)
wave 2				0.0271 (0.0249)
wave 3				-0.0393* (0.0228)
Observations	731	408	368	1507

Notes: The signs *, **, and *** indicate significance at 10, 5, and 1%, respectively. Robust standard errors are in parentheses. The sample includes tobacco farmers in Central and East Java.

4.6. Shifting Behaviors and Income between Waves

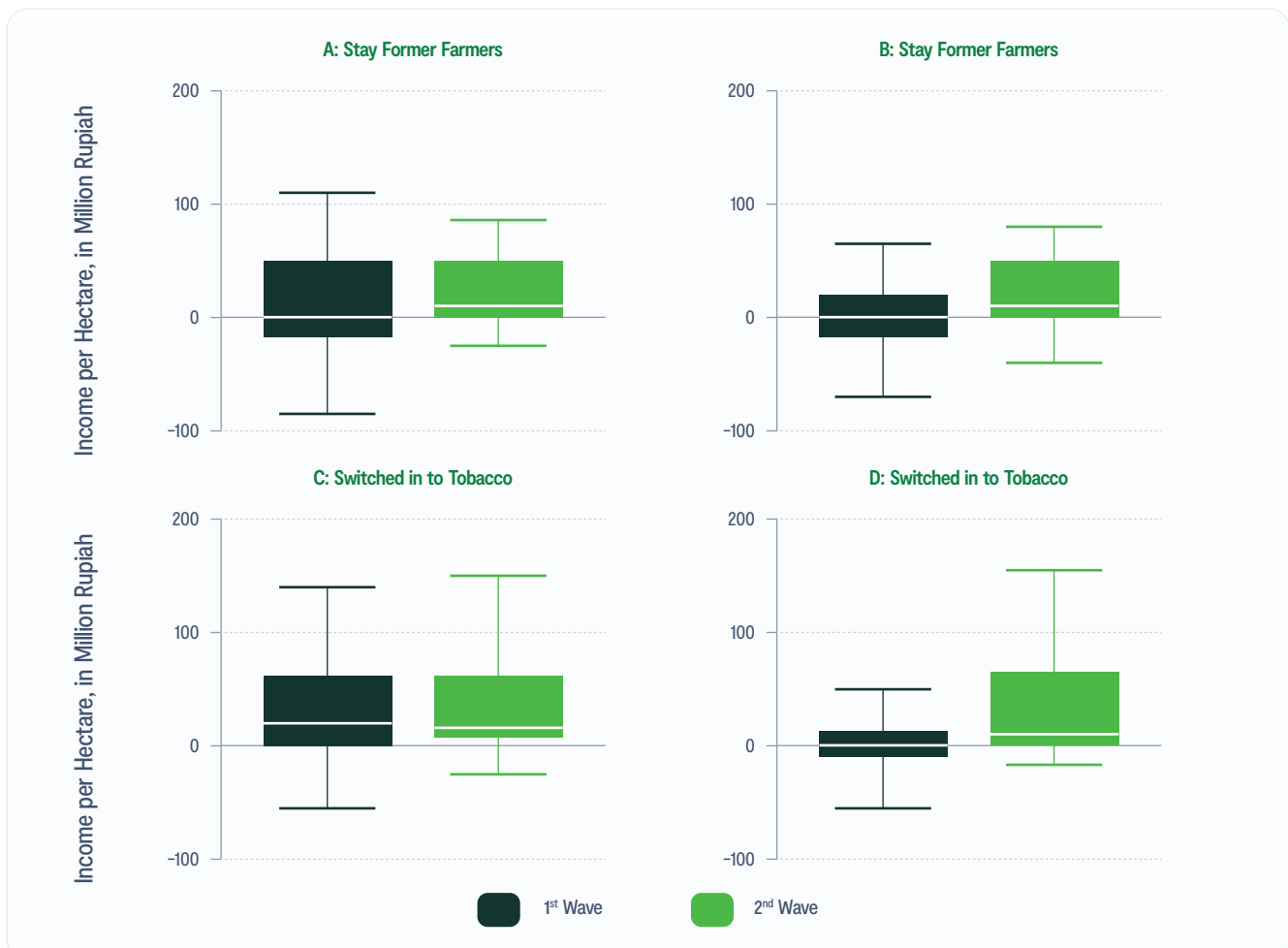
We analyze shifting behaviors and income across waves and present the analysis in Figure 4.9. We categorize farmers into 4 different groups: stay former tobacco farmers (panel A), stay tobacco farmers (panel B), switched into tobacco farming (panel C), and switched out of tobacco farming (panel D). For each group, we compare income per hectare across waves. In general, the proportion of farmers who stayed as tobacco or former tobacco farmers were quite consistent in Wave 2 and Wave 3. However, there was a lower share of farmers who shifted into tobacco farming in Wave 3 (9.46 percent) than in Wave 2 (11.36 percent). On the other hand, the share of tobacco farmers who shifted out of tobacco farming was higher in Wave 3 (12.98 percent) than in Wave 2 (8.33 percent).

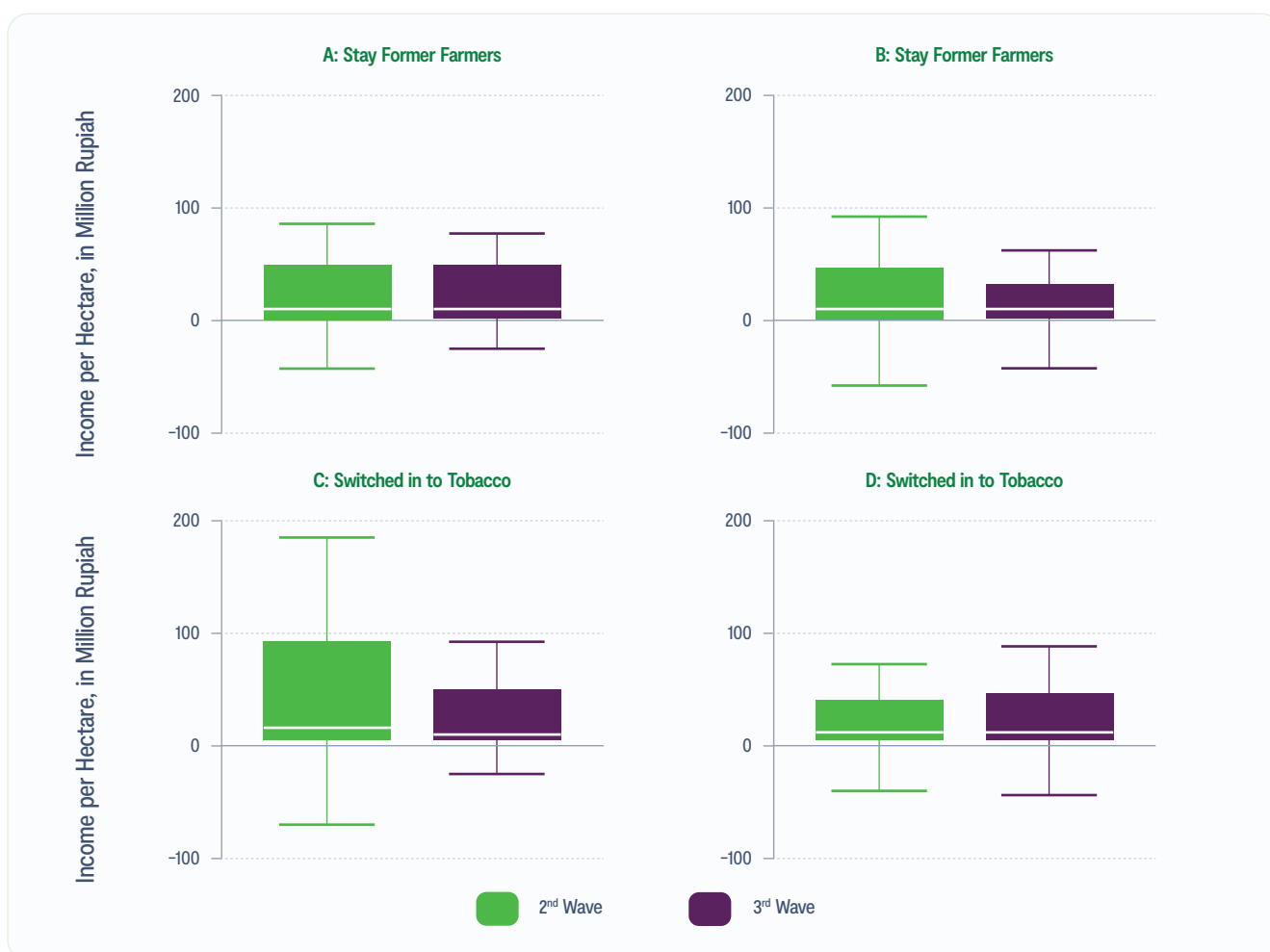
We first discuss shifting behaviors and income between Wave 1 and Wave 2. Farmers who stayed as either tobacco or former tobacco farmers gained

significantly better outcomes in Wave 2. Tobacco farmers, who on average experienced a loss in Wave 1, gained positive income in Wave 2. We find that farmers who switched into tobacco farming in Wave 2 generally gained positive income in Wave 1. One potential explanation among others is that these farmers have capital from Wave 1 profits to pursue tobacco farming. It is important to note that farmers who shifted out of tobacco farming in Wave 2 did significantly better. Given the distribution of income of these farmers, we can argue that they fared better than farmers who switched into tobacco farming.

The story is quite similar in Wave 3. Farmers who stayed as tobacco or former tobacco farmers on average continued to gain positive income. Farmers who shifted into tobacco farming also gained positive income albeit lower than the median. It is encouraging to observe that farmers who switched out of tobacco farming still made positive income.

Figure 4-12. Switching Behavior and Income





Note: The sample includes tobacco and former tobacco farmers in Central and East Java. Outside values were not shown. Between Wave 1 and 2, there were 93 stay former tobacco farmers, 437 stay tobacco farmers, 75 who switched into tobacco farming, and 55 who switched out of tobacco farming. Between Wave 2 and Wave 3, there were 83 stay former tobacco farmers, 425 stay tobacco farmers, 62 who switched into tobacco farming, and 85 who switched out of tobacco farming.

4.7. Why Farmers Continue to Grow Tobacco

We sought to identify reasons why farmers continue to grow tobacco. In the survey, we asked farmers to provide a “yes” or “no” response to factors identified by the literature as reasons to continue to grow tobacco (Chavez et al. 2016; Goma et al. 2017; Magati et al. 2016; Makoka et al. 2017; Drope, Li, et al. 2018; Appau, Drope, Witoelar, et al. 2019; Appau, Drope, Goma, et al. 2019). The design allows tobacco farmers to choose more than one reason. We present the analysis of tobacco farmers’ reasons for growing tobacco in Table 4.23.

Consistently across waves, including in the “bad” year, the majority of tobacco farmers stated that tobacco farming was a highly lucrative enterprise. This

belief may have been driven by underestimation of costs of tobacco farming and underestimation of loss particularly in the bad year. In addition to the expressed reason that tobacco was lucrative, almost 86 percent of farmers stated that they are used to growing tobacco. The portion of those who expressed this reason increased across waves. The pattern is similar for weather. A potential explanation among others is that farmers may have been enjoying relatively good weather and profitable tobacco farming in Wave 2 and Wave 3.

Notably, the share of farmers who stated that tobacco was the only viable cash crop doubled in Wave 3 relative to Wave 2. This could have been

driven by higher volume of tobacco leaf sold in Wave 3 than in Wave 2, although we note that tobacco prices were generally lower in Wave 2. Another

important finding is that a larger share of tobacco farmers received some form of incentive from the tobacco companies in Wave 3.

Table 4-23. Current Tobacco Farmers' Stated Reasons for Growing Tobacco

Reasons	Wave 1	Wave 2	Wave 3
It was a highly lucrative enterprise	73.08	77.73	76.80
I am used to growing tobacco	28.43	74.02	85.83
Weather	26.04	65.43	76.39
Existence of ready market	46.54	60.74	70.43
Availability of land	39.87	59.18	69.82
It was the only viable cash crop	56.73	33.98	65.30
Influenced by other tobacco producers or companies	3.14	3.13	9.86
Good incentives from the tobacco companies	1.01	2.93	12.73
To repay outstanding debts from the tobacco	1.01	0.78	2.05

Note: The sample includes tobacco and former tobacco farmers in Central and East Java.



The Economics of Tobacco Farming in Indonesia:
3rd Wave Tobacco Farmers Survey

Part 5

Child Labor in Tobacco Farming

28 – 63



Image Source:
Pexels by Quang Nguyen Vinh

5. Child Labor in Tobacco Farming

The current and previous report have established that tobacco farming is highly labor-intensive. Tobacco farming involves not only adult labor but also children. We consistently find evidence of child labor in tobacco farming across waves. We report analysis of child labor in tobacco and non-tobacco farming in Table 5.1. In general, the incidence of child labor—household and hired—was higher for tobacco than for non-tobacco farming. The incidence of children working during school hours was also higher for tobacco

farming than for non-tobacco farming.

Incidence of household and hired child labor was higher in Wave 2 and Wave 3 than in Wave 1. This possibly was driven by the relatively higher volume of tobacco sold in Wave 2 and Wave 3. Household child labor for tobacco farming was involved in almost all activities from nursery to post-harvest. On the other hand, hired child labor for tobacco farming was generally evident during post-harvest.

Table 5-1. Child Agricultural Labor, Number of Child Reported

	Tobacco			Non-Tobacco		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
Household Labor						
Nursery	4	2	3	0	1	1
Preparation	2	1	2	0	0	1
Tending	4	5	9	0	5	1
Harvest	2	3	6	2	6	5
Post-harvest	8	13	11	0	10	4
Selling and marketing	0	0	1	1	1	1
Working during school hours	4	6	15	1	1	-
Hired						
Nursery	0	0	0	0	0	0
Preparation	0	0	0	0	0	0
Tending	0	0	0	0	0	0
Harvest	0	0	4	0	0	0
Post-harvest	12	35	28	0	0	0
Selling and marketing	0	0	0	0	0	0

Note: The sample includes tobacco and former tobacco farmers in Central and East Java.

The Economics of Tobacco Farming in Indonesia:
3rd Wave Tobacco Farmers Survey

Part 6

Well-being

64 - 67



Image Source:
Pexels by Kelly Lacy

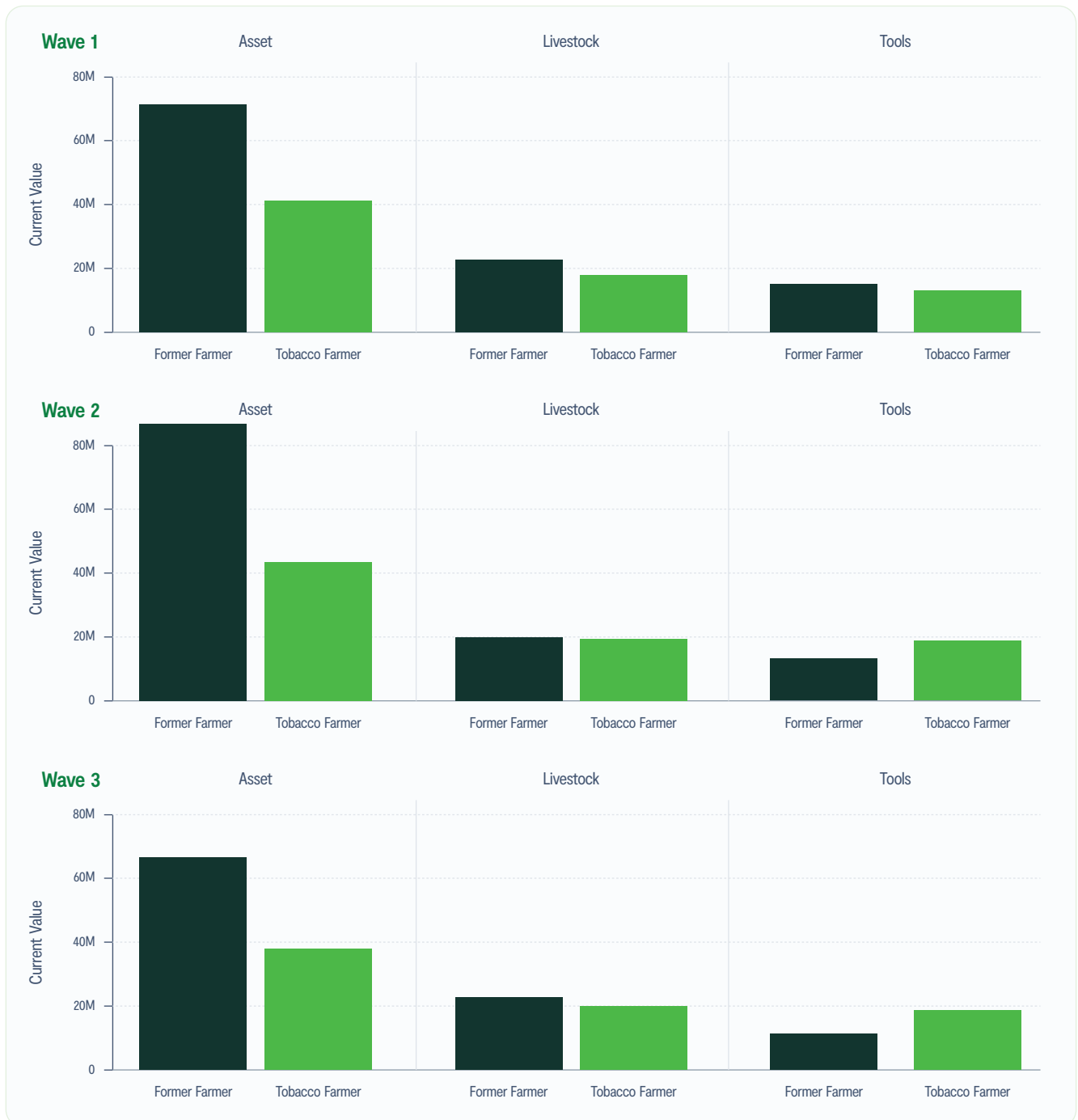
6. Well-being

6.1. Assets Accumulation

Household assets may reflect the dynamics of household income. There is anecdotal evidence that farmers who reap profits purchase assets such as motorcycles, furniture, as well as household appliances. In a bad year, farmers may tend to sell their assets to cover economic losses from the farming endeavor. We

report median overall assets by types by current and former tobacco farmers in Figure 6 1, and the analysis of ownership of different types of assets by current and former tobacco farmers in Table 6.1. Specifically in the table, we report the share of farmers owning a particular asset and the median value of different assets

Figure 6-1. Median Assets of Current Tobacco and Former Tobacco Farmers by Asset Types



In general, a typical former tobacco farmer has higher assets and livestock than a typical current tobacco farmer. Tobacco farmers enjoyed relatively profitable time periods during Wave 2 and Wave 3, and asset accumulation may have reflect the profits obtained. For example, the share of tobacco farmers owning a satellite dish, refrigerator, LPG tube, washing machine, handphone, electric pump, and vehicle were generally higher in Wave 2 and Wave 3 than in Wave 1. The median current value of large stocks such as cow,

buffalo, and horse, was also higher in Wave 2 and Wave 3 than in Wave 1.

In Wave 3, shares of ownership of several assets were higher among former tobacco farmers. For example, more former tobacco farmers owned a satellite dish, refrigerator, LPG tube, washing machine, and/or electric pump. A higher share of former tobacco farmers owned large stocks with higher values relative to current tobacco farmers.

Table 6-1. Household and Agricultural Assets – Former vs Current Tobacco Farmers (percentage and current value)

Asset	Current						Former					
	Wave 1		Wave 2		Wave 3		Wave 1		Wave 2		Wave 3	
	Ownership	Current Value	Ownership	Current Value	Ownership	Current Value	Ownership	Current Value	Ownership	Current Value	Ownership	Current Value
TV	91.70	300,000	91.41	289,547	93.84	273,349	93.33	300,000	89.19	289,547	92.86	273,349
DVD/VCD player/home theater/radio	43.14	100,000	39.65	72,387	-	-	38.43	100,000	38.51	96,515	-	-
Satellite Dish	6.54	300,000	7.42	434,321	9.03	364,465	10.98	325,000	12.84	386,063	11.90	273,349
Electric oven/microwave	2.14	100,000	2.15	48,258	3.08	136,674	1.57	75,000	2.03	24,129	3.57	68,337
Refrigerator	31.19	575,000	33.01	579,095	42.30	455,581	40.00	500,000	40.54	530,837	48.81	455,581
LPG tube 3kg or more	84.91	100,000	87.70	96,516	93.63	91,116	89.02	100,000	87.84	96,516	95.24	91,116
Washing machine	5.28	600,000	6.84	579,095	9.24	455,581	5.49	650,000	5.41	579,095	10.71	455,581
AC	1.26	100,000	0.39	265,418	1.03	455,581	0.78	510,000	2.03	48,258	0.00	-
Telephone	0.00	-	0.00	-	0.00	-	0.39	50,000	0.00	-	0.00	-
Handphone	76.73	150,000	83.40	289,547	85.01	455,581	78.82	100,000	79.73	193,032	85.17	455,581
Computer	7.92	1,500,000	9.18	1,447,737	-	-	9.02	2,000,000	9.46	1,447,737	-	-
Tablet	6.67	400,000	8.20	349,870	5.75	273,349	8.24	400,000	8.78	289,547	4.17	273,349
Video camera/camera	1.51	500,000	2.15	579,095	-	-	1.57	525,000	0.68	482,579	-	-
Water heater	0.50	550,000	0.59	675,610	1.44	455,581	0.39	100,000	0.00	-	0.00	-
Electric pump	35.60	100,000	35.74	144,774	52.16	136,674	30.20	100,000	38.51	144,774	58.33	136,674
Generator	2.39	800,000	2.15	965,158	2.87	797,267	4.71	750,000	4.05	868,642	1.19	956,720
Vehicle	8.05	30,000,000	9.18	30,885,050	11.70	27,334,852	8.24	60,000,000	5.41	82,038,413	8.93	54,669,704
Motorcycle	89.94	5,000,000	92.19	5,790,947	93.84	5,466,970	89.41	6,000,000	89.86	6,756,105	91.07	6,378,132
Livestock												
Large stocks: cow, buffalo, horse	27.92	15,000,000	31.45	16,407,683	31.62	16,400,911	30.98	20,000,000	45.95	17,855,419	44.05	18,223,235
Small stocks: Goat, sheep, pigs	31.07	2,000,000	26.37	1,930,316	22.59	2,733,485	23.53	2,000,000	20.95	1,930,316	15.48	2,733,485
Poultry: Chicken, ducks, geese, quail	43.77	200,000	48.24	241,289	43.12	252,847	34.51	200,000	55.41	241,289	51.79	255,125
Agricultural & Farming Goods												
Wagon	6.54	200,000	8.79	193,032	11.70	136,674	2.35	200,000	6.76	96,516	9.52	113,895
Plough	1.01	150,000	1.37	6,756,105	0.62	9,111,617	2.35	1,100,000	1.35	1,935,141	1.19	54,670
Tractor	7.17	8,000,000	7.42	7,721,262	9.03	7,517,084	5.10	9,000,000	9.46	8,203,841	6.55	7,289,294
Water pump	19.62	1,000,000	22.27	772,126	28.95	637,813	16.08	700,000	23.65	675,610	27.38	683,371
Chopper machine	10.82	1,500,000	14.26	1,447,737	22.38	911,162	4.71	800,000	4.05	723,868	2.98	546,697
Sprayer	0.00	-	80.66	144,774	83.98	182,232	0.00	-	67.57	96,516	76.79	136,674
Hoe	0.00	-	99.61	48,258	100	45,558	0.00	-	98.65	28,995	97.02	36,446
Sickle	0.00	-	98.44	19,303	99.59	18,223	0.00	-	97.97	19,303	96.43	13,667
Other, V1	52.45	50,000	11.52	48,258	38.40	18,223	51.76	50,000	8.78	19,303	26.79	18,223
Other, V2	42.77	20,000	1.76	14,477	5.34	20,501	43.14	20,000	2.03	4,826	5.95	25,057

Note: The sample is restricted to households who were observed in all survey waves. Current values of assets in the second and third wave are adjusted for inflation.

6.2. Food Security

We analyze farming household food security through food self-sufficiency and longevity of food supply. We report the analysis of farming household food security in Table 6.2. In Wave 3, about 68 percent of tobacco farming households produced their own food. The share is slightly higher for former tobacco farming households at about 74 percent. It is important to note that the share of tobacco farming household

with food self-sufficiency was lower in Wave 3 than in the previous waves. There is no noticeable change in the share of former tobacco farmers with food self-sufficiency between Wave 2 and Wave 3. On average, both current and former tobacco farming households have food that would last for about 8 months. The average longevity of food supply was generally higher in Wave 3 than in the previous waves.

Table 6-2. Staple Food Production by Month

	Current			Former		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
HH produce their own food, %	72.58	73.83	67.76	68.23	75.68	73.81
Longevity of food supply in months, average	7.73	7.02	8.10	7.40	7.29	7.91
Months of food supply, month	%			%		
=<1	3.3	7.9	5.1	5.2	9.8	4.8
2	3.9	4.5	4.2	3.5	5.4	3.2
3	10.8	14.6	8.8	14.9	11.6	9.7
4	15.1	10.8	11.5	12.6	8.0	9.7
5	3.9	6.3	3.0	9.2	7.1	5.7
6	9.2	7.7	10.9	9.8	8.9	11.3
7	3.1	4.2	3.9	0.6	0.0	2.4
8	6.4	4.5	4.2	3.5	5.4	8.9
9	1.9	1.6	3.9	0.6	3.6	3.2
10	2.4	3.2	3.3	2.9	0.9	2.4
11	0.9	0.8	0.3	0.0	0.0	0.8
>=12	38.9	33.6	40.6	37.4	39.3	37.9

Note: The sample includes tobacco and former tobacco farmers in Central and East Java.

Across waves and regions, the majority of tobacco farmers reported lacking sufficient food to feed their households. We report the analysis of food self-sufficiency, level of food security, number of income source, and share of tobacco farmers who seriously considered switching in Table 6.3. In general, most tobacco farmers reported consuming rice as the main staple food. However, in Magelang, rice is not the staple. There is also variation in food self-sufficiency across regions. Tobacco farmers in East Java tend to produce their own food. In contrast, only about 15 and 36 percent of tobacco farmers in Temanggung and Magelang reported producing their own food, respectively.

The majority of tobacco farmers across regions reported that they lack sufficient food. In Wave 3, about 90 percent of tobacco farmers in Magelang reported lacking sufficient food. The share is slightly higher in East Java as more than 95 percent of tobacco farmers in Lumajang, Jember, and Bojonegoro reported lacking sufficient food. This finding is striking as much land was dedicated to tobacco farming and the perception that tobacco is a viable crop. Yet many farming households reported lacking sufficient food. Although not presented in this report, former tobacco farmers also generally reported lacking sufficient food.

Table 6-3. Perceived Level of Food Security of Current Tobacco Farmers

	Wave 1	Wave 2	Wave 3
Magelang			
Rice is the main staple food, %	51.7	41.2	70.8
Produce own food, %	50.0	65.0	36.1
Level of food security (mode)	3	3	3
Always has sufficient food, %	1.67	5	1.39
Usually has sufficient food, %	10.03	10	6.94
Usually lacks sufficient food, %	61.67	76.25	56.94
Always lacks sufficient food, %	25.83	8.75	34.72
Number of income source, average	0.96	1.21	1.01
Serious switching, %	0.83	13.75	2.78
Temanggung			
Rice is the main staple food, %	88.3	88.5	97.4
Produce own food, %	28.3	26.9	15.4
Level of food security (mode)	3	3	3
Always has sufficient food, %	2.50	10.26	5.13
Usually has sufficient food, %	9.17	7.69	10.26
Usually lacks sufficient food, %	55.83	65.38	47.44
Always lacks sufficient food, %	32.50	16.67	37.18
Number of income source, average	0.94	1.10	0.73
Serious switching, %	2.50	8.97	11.54
Lumajang			
Rice is the main staple food, %	100.0	100.0	100.0
Produce own food, %	89.3	84.3	91.4
Level of food security (mode)	3	3	3
Always has sufficient food, %	-	-	-
Usually has sufficient food, %	4	1.2	1.72
Usually lacks sufficient food, %	58.67	63.86	50
Always lacks sufficient food, %	37.33	34.94	48.28
Number of income source, average	0.76	0.71	0.71
Serious switching, %	1.33	2.41	1.72
Jember			
Rice is the main staple food, %	100.0	100.0	100
Produce own food, %	80.0	76.8	75.2
Level of food security (mode)	3	3	4
Always has sufficient food, %	2.08	2.17	2.13
Usually has sufficient food, %	5.83	7.97	1.42
Usually lacks sufficient food, %	51.67	58.7	46.10
Always lacks sufficient food, %	40.42	31.16	50.35
Number of income source, average	0.62	0.78	0.61
Serious switching, %	5.00	2.90	6.38

	Wave 1	Wave 2	Wave 3
Bojonegoro			
Rice is the main staple food, %	100.0	100.0	100
Produce own food, %	93.3	97.0	96.4
Level of food security (mode)	3	3	4
Always has sufficient food, %	2.50	-	0.72
Usually has sufficient food, %	5.42	4.51	2.90
Usually lacks sufficient food, %	51.25	62.41	46.38
Always lacks sufficient food, %	40.83	33.08	50
Number of income source, average	1.04	1.01	0.96
Serious switching, %	4.17	3.01	0.00

Note: The sample includes tobacco and former tobacco farmers in Central and East Java.



The Economics of Tobacco Farming in Indonesia:
3rd Wave Tobacco Farmers Survey

Part 7
**Green Tobacco
Sickness**

72 - 75



Image Source:
Pexels by Dung Nguyen

7. Green Tobacco Sickness

Tobacco farmers are commonly exposed to green tobacco sickness (GTS), which is a form of acute nicotine poisoning stemming from directly handling tobacco leaves and absorbing nicotine both from respiration and absorption through the skin (Arcury et al. 2003; Da Mota E Silva et al. 2018). Because tobacco farming is agricultural chemical intensive, they also typically face larger exposures to these often-toxic substances. Finally, many farmers that grow Virginia leaf typically cure it through heat produced by fires that generate significant smoke that is inhaled by

farmers. We analyze the share of current and former tobacco household members who reported sickness in the past 30 days. We report the analysis in Table 6.4. The share of tobacco household members who reported sickness increased between Wave 1 and Wave 2. The share across regions declined in Wave 3. Gender differences in the incidence of sickness varied across age groups. The incidence was higher among male than female aged 21–35, but it was higher among females than males aged 36 and above.

Table 7-1. Reported Sickness in Last 30 Days by Gender and Age — Current and Former Tobacco Household

Age Group	Current Tobacco Households, Male Participated in Tobacco Farming in The Past 12 Months			Current Tobacco Households, Female Participated in Tobacco Farming in The Past 12 Months		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
<15	14.29	0.00	37.50	33.33	22.22	14.29
15–20	15.28	31.91	24.39	17.65	43.48	26.67
21–35	15.08	39.22	29.46	15.72	39.31	23.97
36–60	25.59	50.27	38.53	26.45	50.87	45.56
>60	34.23	58.73	47.45	33.33	56.60	50.00
Age Group	Former Tobacco Households, Male Members			Former Tobacco Households, Female Members		
<15	31.25	57.6	32.81	17.92	41.0	40
15–20	15.79	31.6	36	0.00	30.0	29.17
21–35	14.81	32.6	41.30	19.33	38.7	30.65
36–60	21.43	35.1	44.83	27.17	52.1	46.51
>60	39.29	56.8	50	34.15	65.2	53.66

Note: The sample includes tobacco and former tobacco farmers in Central and East Java.

The incidence of individuals reporting the main symptoms of GTS) was generally lower in Wave 3 than in Wave 2. The main symptoms of GTS include weakness, headache, nausea, vomiting, dizziness, abdominal cramps, breathing difficulty, abnormal temperature, pallor, diarrhea, chills, fluctuations in blood pressure or heart rate, and increased perspiration and salivation. We present the share of household members reporting 1–4 main symptoms of GTS in Table 6.5. We find that older female household

members are associated with a higher likelihood of reporting main symptoms of GTS. In Wave 3, about 36 percent of female household members above 60 reported main symptoms of GTS, but only about 9 percent of male household members above 60 that reported main symptoms of GTS. This could partly be explained by female household members' involvement in tending of tobacco leafs and post-harvest activities including curing.

Table 7-2. Household Members Reporting 1–4 Main Symptoms* of Green Tobacco Sickness

Age Group	Wave 1	%	Wave 2	%	Wave 3	%
Male						
<21	41	6.55	73	20.54	37	10.14
21–35	29	7.89	53	22.55	35	17.33
36–60	84	10.55	133	27.03	102	21.38
>60	30	13.97	60	17.33	52	8.78
Female						
<21	36	6.11	57	15.98	46	13.61
21–35	40	8.42	74	25.96	40	16.19
36–60	102	13.05	168	32.50	149	28.06
>60	19	11.80	52	42.98	51	35.92

Note: Symptoms of GTS include weakness, headache, nausea, vomiting, dizziness, abdominal cramps, breathing difficulty, abnormal temperature, pallor, diarrhea, chills, fluctuations in blood pressure or heart rate, and increased perspiration and salivation.

We investigate relationships between experiencing a GTS symptom and individual as well as household-level factors using a logistic regression analysis. In particular, we regress a binary variable of experiencing at least one GTS symptom with an indicator of tobacco farming household, hours spent in tobacco farming activities in log, costs of pesticides in log, age group, an indicator of gender, an indicator of marriage, district indicator, and time fixed effect. We then calculate the average marginal effects for each variable. We present the result in Table 6.6.

The estimated coefficient of hours in the tobacco field is negative, which suggests that household members who stayed longer in the tobacco field were associated with lower likelihood of having a GTS. The negative coefficient may suggest the issue of selection as household members who spent more time in the field are those who are healthier. Thus, they are less likely to experience a GTS symptom. We also investigate whether experiencing GTS symptoms is associated with tobacco farming activities such as

nursery, land preparation, field tending, harvest, post harvest including curing, as well as selling and marketing. In general, we find no association between experiencing GTS symptoms and tobacco farming activities. However, in Wave 1, we find that household members who participated in land preparation including transplant are more likely to experience GTS as well. In Wave 3, we find that household members who participated in post harvest including curing are more likely to experience GTS symptoms as well.

Consistent with finding in Table 6.5, female household members were associated with a higher likelihood of having a GTS symptom. Older household members, particularly those 36 and above, were also associated with a higher likelihood of having a GTS symptom. There was a variation across regions as well. Individuals in Bojonegoro were less likely to have a GTS symptom than individuals in Magelang as well as other regions in Wave 2 and Wave 3. Lastly, the likelihood of an individual having a GTS symptom was higher in Wave 2 and Wave 3 than in Wave 1.

Table 7-3. Logistic Regression of Green Tobacco Sickness Determinants: Average Marginal Effects

	A: Wave 1	B: Wave 2	C: Wave 3	D: Wave 1-3
1 if current farmer	0.309* (0.176)	0.262 (0.317)	0.438 (0.332)	0.258* (0.144)
Hour tobacco farming, in log	-0.0191 (0.0132)	-0.0189 (0.0234)	-0.0427 (0.0262)	-0.0179* (0.0108)
Costs of pesticides, in log	-0.000383 (0.00153)	0.00726* (0.00439)	0.000978 (0.00403)	0.00146 (0.00165)
1 if participated in nursery	0.0247 (0.0286)	-0.0607 (0.0579)	-0.0656 (0.0579)	-0.0201 (0.0226)
1 if participated in land preparation & transplant	0.00969 (0.0482)	0.135** (0.0623)	-0.0795 (0.0656)	0.0324 (0.0283)
1 if participated in field tending	-0.0141 (0.0817)	-0.00465 (0.0688)	0.0158 (0.0684)	-0.00691 (0.0360)
1 if participated in harvest	-0.0456 (0.0418)	0.0144 (0.0881)	0.0575 (0.0812)	-0.0263 (0.0371)
1 if participated in post-harvest incl. curing	0.00394 (0.0352)	-0.0833 (0.0809)	0.147** (0.0713)	0.00745 (0.0325)
1 if participated in selling and marketing	0.0178 (0.0300)	0.0184 (0.0544)	0.0124 (0.0578)	0.00635 (0.0225)
1 if female	0.0242 (0.0224)	0.0404 (0.0481)	0.0593 (0.0399)	0.0399** (0.0179)
21-35 years	0.0111 (0.0719)	.	0.0396 (0.102)	0.0497 (0.0553)
36-60 years	0.0506 (0.0695)	.	0.105 (0.105)	0.0933* (0.0566)
60 years	0.0299 (0.0704)	.	0.143 (0.111)	0.0909 (0.0588)
1 if married	-0.0373 (0.0294)	0.131 (0.0847)	0.0856 (0.0570)	0.0320 (0.0305)
Years of schooling	-0.00759** (0.00317)	-0.0200*** (0.00711)	-0.00932 (0.00603)	-0.0117*** (0.00304)
1 if Temanggung	0.0686 (0.0421)	0.0499 (0.0828)	0.122 (0.0889)	0.0614 (0.0388)
1 if Lumajang	-0.0320 (0.0311)	-0.0352 (0.0804)	-0.0983 (0.0736)	-0.0476 (0.0321)
1 if Jember	-0.0374 (0.0284)	0.000679 (0.0778)	-0.110 (0.0721)	-0.0459 (0.0297)
1 if Bojonegoro	0.00484 (0.0296)	-0.140** (0.0666)	-0.169** (0.0664)	-0.0726*** (0.0278)
1 if wave 2 TFS				0.166*** (0.0246)
1 if wave 3 TFS				0.126*** (0.0236)
Observations				(0.0229)

Notes: the sample includes tobacco and former tobacco farmers in Central and East Java. The signs *, **, and *** indicate significance at 10, 5, and 1%, respectively. The omitted district is Magelang and the omitted age group is below 21. Cluster robust standard errors at the household level are in parentheses.

The Economics of Tobacco Farming in Indonesia:
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Part 8

Farmer's Satisfaction with Farming

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8. Farmer's Satisfaction with Farming

In the survey, we asked farmers about their satisfaction with topics pertaining to farming context and activities, including crop portfolio, marketing of the crops, financing process, labor recruitment, and weather prediction. We compare satisfaction on farming between tobacco and former tobacco farmers, and we present the analysis in Table 6.7. We also test whether there is a difference in the distribution of responses between tobacco and former tobacco farmers, and we present the p-value of the Pearson Chi-square test.

In general, both tobacco and former tobacco farmers were satisfied or very satisfied with their crop portfolio, marketing of the crops, financing process of farming, and labor recruitment. There was no significant difference in satisfaction between tobacco and former tobacco farmers. However, it is interesting to note that a large proportion of former tobacco farmers were dissatisfied with the weather prediction last year. Tobacco farmers on the other hand were quite satisfied with the prediction as in general they experienced good tobacco farming year.

Table 8-1. Farmers' Satisfaction with Farming

	Very Dissatisfied	Dissatisfied	Satisfied	Very Satisfied	Pearson Chi-sq p-value
Satisfaction on Crop Portfolio					
Former	0.60	4.76	78.57	16.07	0.284
Current	1.44	8.21	77.62	12.73	
Satisfaction on Marketing of The Crops					
Former	0.60	9.52	74.40	15.48	0.349
Current	1.64	13.76	71.05	13.55	
Satisfaction on Financing Process of Farming					
Former	0.00	14.29	75.00	10.71	0.168
Current	2.26	15.81	73.92	8.01	
Satisfaction on Labor Recruitment					
Former	0.60	4.76	77.98	16.67	0.191
Current	0.76	7.33	79.08	12.82	
Satisfaction on Weather Prediction Last Year					
Former	4.76	42.86	46.43	5.96	0.002
Current	3.90	28.75	55.03	12.32	

Notes: The statistics are calculated from the 3rd wave survey

8.1. Farmer’s Subjective Well-Being

In Wave 3, we introduced a number of questions to capture non-monetary well-being of farmers. This set of questions include questions to measure farmers’ life satisfaction and their satisfaction with various aspects of living conditions, their happiness, as well as their perceptions on where they are on the income distribution.¹ We analyze these variables for both tobacco and former tobacco farmers. We also test whether there are significant differences in responses between tobacco and non-tobacco farmers.

We present the result of the life satisfaction analysis in Table 6.8. Questions on life satisfaction are designed to ask the respondents to evaluate their lives as a whole. Respondents are expected to reflect on the whole trajectory of their lives and provide a subjective assessment of their accomplishments as well as nonfulfillment. The majority of tobacco and non-tobacco farmers were somewhat satisfied, but in general the majority of farmers were satisfied with their life. There was no significant difference in responses between tobacco and former tobacco farmers.

Table 8-2. Life Satisfaction

Life Satisfaction	Completely Satisfied	Very Satisfied	Somewhat Satisfied	Not very Satisfied	Not at all Satisfied	Pearson Chi-sq p-value
Former	7.14	15.48	69.05	6.55	1.79	0.834
Current	4.93	16.84	68.99	7.60	1.64	

Notes: The statistics are calculated from the 3rd wave survey

In addition to evaluating their lives, we also explore farmers’ satisfaction regarding different aspects of standard of living. In Table 6.9, we report the result of analyses regarding perceptions of standard of living among tobacco and non-tobacco farmers. In general,

tobacco and former tobacco farmers stated that their current family life, standard of living, children’s education are either adequate or more than adequate. We do not find significant difference in responses between tobacco and former tobacco farmers.

¹ The questions used in this survey have widely been used in household surveys around the world, including Indonesia. The questions include the standard question on life satisfaction, the question on happiness, as well as a Cantrill Ladder to measure perception of relative income. See Kahneman and Krueger (2006) for a literature review on the use of the performance of these measures in capturing the well-being of individuals. In Indonesia, these measures have been used in many surveys, including the Indonesia Family Life Survey (IFLS).

Table 8-3. Perception on Standard of Living

	Less than Adequate	Adequate	More than Adequate	Don't know	Pearson Chi-sq <i>p</i> -value
Perception Regarding the Current Family Life					
Former	11.31	75.60	13.10	-	0.533
Current	13.55	75.98	10.47	-	
Perception Regarding the Current Standard of Living					
Former	16.07	69.94	14.29	-	0.580
Current	15.20	73.31	11.50	-	
Perception Regarding Children's Education					
Former	14.94	67.82	17.24	-	0.246
Current	19.16	69.81	11.04	-	
Perception Regarding the Current Family Life					
Former	16.09	71.25	12.64	-	0.678
Current	20.78	68.83	10.06	0.32	

Notes: The statistics are calculated from the 3rd wave survey

Unlike questions on life satisfaction, the question on happiness does not require respondents to reflect and evaluate their overall happiness. The question is designed to capture immediate, in-the-moment, subjective well-being of respondents.

The result, presented in Table 8 4 below, shows that more than 92 percent of both tobacco and former tobacco farmers are either happy or very happy. There does not seem to be any difference between former and current tobacco farmers.

Table 8-4. Happiness

Perception Regarding Happiness	Very happy	Happy	Unhappy	Very Unhappy	Pearson Chi-sq <i>p</i> -value
Former	10.12	82.14	7.14	0.60	0.887
Current	9.03	83.78	6.16	1.03	

Notes: The statistics are calculated from the 3rd wave survey

The final subjective question that we are reporting is the farmers' assessment on where they are on income distribution. For this question, we first ask a standard question that require respondent to put themselves on a Cantrill ladder of income distribution. The question is asked for their perception on their current income as well as income in the future. In addition to self-assessment question, we also introduced a set of anchoring vignettes in the questionnaire, a tool that is increasingly used to

address the issue if interpersonal comparability in self-assessment questions. We will first discuss the findings using the standard self-assessment question before discussing the results from the vignettes.

Table 6.11 shows the results from self-assessment questions on relative income. Farmers tend to put themselves on the middle of the distribution. About 45 percent of tobacco and non-tobacco farmers stated that they were neither

richer nor poorer than their counterparts. There is no significant difference in perception between tobacco

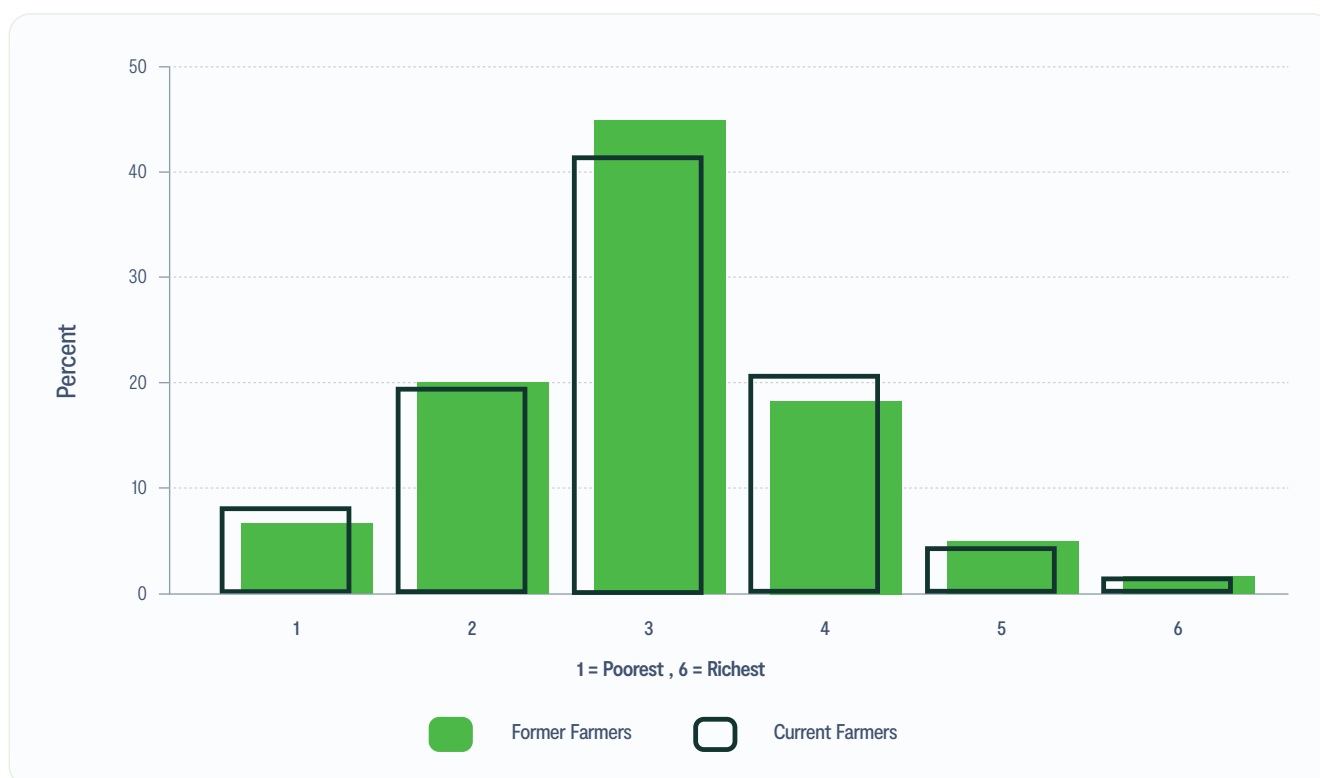
and former tobacco farmers. Figure 8.1 shows the histogram of these responses.

Table 8-5. Self-assessment of Relative Income

Income Ladder	Former	Current
1: poorest	5.95	7.19
2	20.83	20.53
3	45.83	44.15
4	20.24	21.56
5	5.95	5.54
6: richest	1.19	1.03
Pearson Chi-sq p-value	0.991	

Notes: The statistics are calculated from the 3rd wave survey

Figure 8-1. Histogram of Self-Assessment Questions on Relative Income



When respondents were asked to put themselves on a scale of 1 (poorest) to 6 (richest), each respondent may have different standards of what constitutes poor or rich. A person or a group of people can have lower standards on what they consider “rich” and they will systematically report to be richer than the other groups. In addition to the

self-assessment question, the respondents were presented with hypothetical descriptions (vignettes) of people or situations and asked to place the person in the vignettes on the same ordinal scale. With this survey design, it is possible to construct a common scale across respondents and analyze the data.

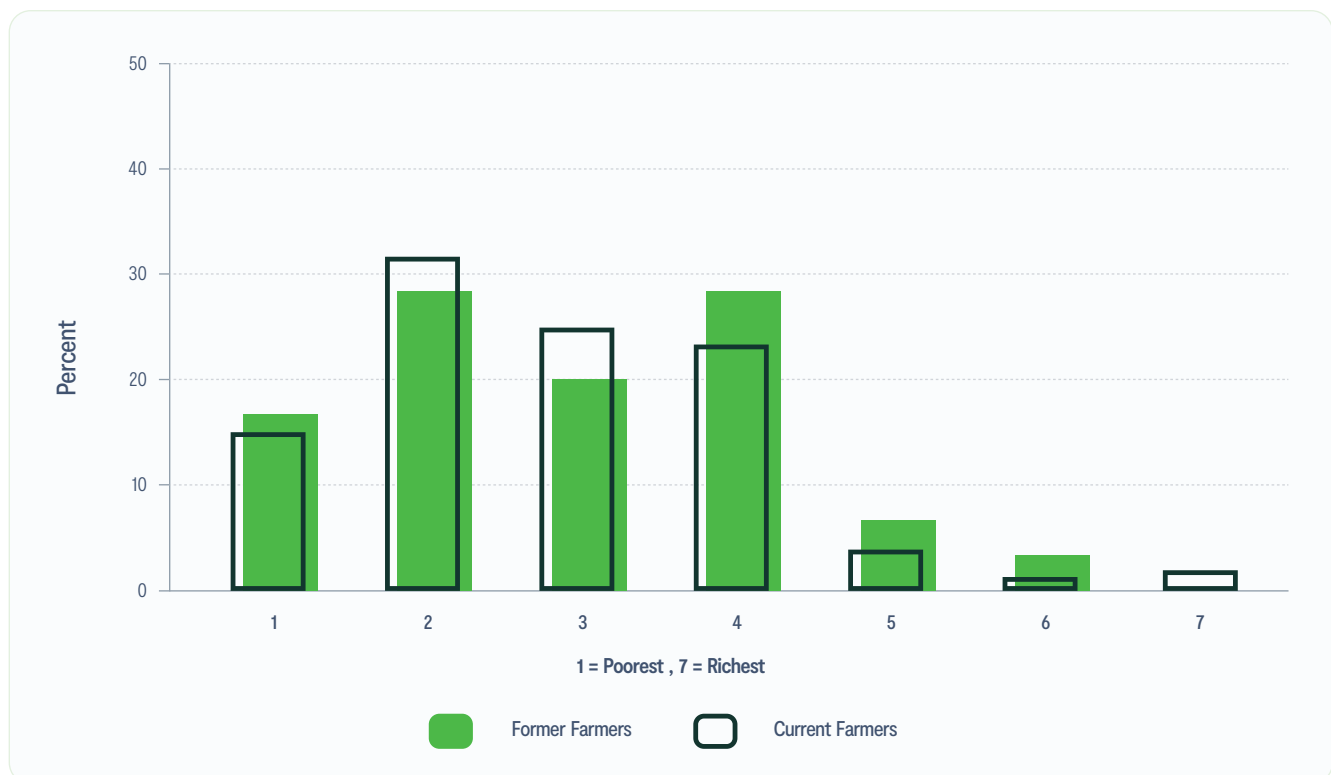
There were four vignettes, depicting four different individuals and their consumption patterns on food, clothing, schooling, and their ownership assets (see Appendix A). Again, the respondents were asked to put the person in the vignettes on a scale of 1 to 6. Since the same vignettes were being asked to respondents, their answers would serve as anchors on how they rate subjective well-being. The vignettes are from (Ravallion, Himelein, and Beegle 2016) adapted to the Indonesian context. Vignette 1 was designed to depict the poorest household and vignette 4 the richest. The order in which the vignettes were being asked was random (randomization done by CAPI).²

We present the results from analyzing the data non-parametrically,³ following King and Wand (2007).

We do this by creating a new scale based on the information we collect from the vignettes. The adjustments were done recoding the self-assessment response as less than, equal to, or greater than the vignette response, and dealing with tied responses. By doing so we end up with a new scale ranging from 0 (poorest) to 7 (richest). (see Appendix B for detail).

Figure 8-2 below shows the distribution of the self-assessment of relative income, now adjusted using the vignettes. The figure shows some differences in the distribution of the adjusted responses, showing that larger proportion of former farmers are on step 4 or higher (36%) compared to current tobacco farmers (28%).

Figure 8-2. Vignette-Adjusted Self-Assessment of Relative Income: Current and Former Farmers



² The approach is based on two key assumptions: vignette equivalence, and response consistency. The first assumption means that all respondents interpret the vignettes in the same way. Living conditions depicted in each vignette is understood by respondents in the same way, even though respondents may put the living conditions on a different scale. The second assumption means that respondent is using the same scale in their self-assessment as well as in evaluating the vignettes. See King et al (2007).

³ It is also common to supplement the analysis using parametric approach, for example by estimating the probability of position in a scale using an ordered probit estimation.

Additionally, we also analyze the relationship between this self-assessment of income and constructed quintiles of per capita income. Our findings (see Appendix) suggest that for current tobacco farmers, the self-assessment of income and

per capita income are not strongly correlated. On the other hand, for former farmers there is a significant correlation between the two measures. The finding suggests that former farmer have better ability in assessing their relative income than current farmers.

8.2. Risk Attitude

In the survey, farmers were presented with a set of hypothetical situations to measure risk preference. For example, in the survey, respondents were presented with two options to get income from planting crops. The first option offers a guaranteed income of Rp1 million, while the second option offers an income of Rp2 million or Rp1 million with the same likelihood. Respondents were asked to choose between one of the two options. We use farmers' responses to these questions to identify their risk preference. We present the result of analyses on tobacco and former tobacco farmers' risk

attitude in Table 6.10.

In general, we find no significant difference in risk attitude of tobacco and former tobacco farmers. This result is consistent for both measures of risk aversion. Interestingly, the result shows that farmers were either risk averse or not. We also find that only about 17 percent of farmers have aversion towards gambling. There is no significant difference in gambling aversion between tobacco and former tobacco farmers.

Table 8-6. Risk Attitude of Tobacco and Former Tobacco Farmers

Risk Aversion Measure 1	Former	Current	Risk Aversion Measure 2	Former	Current	Gamble Aversion	Former	Current
1: least risk averse	29.76	32.30	1: least risk averse	35.71	39.15	0: No	83.33	82.51
2	16.67	12.35	2	20.00	14.96	1: Yes	16.67	17.49
3	7.14	8.02	3	8.57	9.73			
4	29.76	29.84	4: most risk averse	35.71	36.16			
5: most risk averse	16.67	17.49						
Pearson Chi-sq p-value		0.706			0.554			0.808

Notes: The statistics are calculated from the 3rd wave survey



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The Economics of Tobacco Farming in Indonesia:
3rd Wave Tobacco Farmers Survey

Part 9

Conclusion & Policy Recommendations

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9. Conclusion & Policy Recommendations

The results of analyses of the Wave 3 TFS further provide comprehensive understanding on the livelihoods of current and former tobacco farmers in Indonesia. Combining with the Wave 1 and Wave 2 TFS data, we obtain a three-wave longitudinal dataset of the same panel of tobacco and non-tobacco farmers. The panel dataset allows key analyses—such as of income, agricultural profits, agricultural inputs, labor use—for both tobacco and former tobacco farmers across time periods.

Tobacco and former tobacco farmers enjoyed another good year in Wave 3 TFS. On average, tobacco and former tobacco farmers gained positive income in Wave 3. Former tobacco farmers not only made positive agricultural income, but former tobacco farmers also gained higher profits from enterprise income, agricultural and non-agricultural wage income, and other income. The more diverse economic portfolio of former tobacco farmers is one of the reasons why they still made positive income during the “bad” farming year of 2016.

The result of a regression analysis of both tobacco and former tobacco farmers shows that a larger share of land for tobacco farming has a negative effect on household income. This finding strongly suggests that shifting away from tobacco may have a favorable effect on household income.

The volume of tobacco leaf sold increased by about 26.5 percent in Wave 3. Tobacco prices in Wave 3 were favorable compared to Wave 1 prices, but Wave 3 prices were still below Wave 2 prices. Specifically, Wave 3 prices were lower by about 24 percent than Wave 2 prices. Higher volume of tobacco leaf sold but lower prices led to decreased sales in

Wave 3 by about 19 percent.

Overall, tobacco farming was profitable in Wave 3. One of the main explanations of the favorable tobacco farming outcomes in Wave 2 and Wave 3 was the desirable weather. The average rainfall in Wave 2 and Wave 3 were quite close to the long-term average. This is contrast with the rainfall in Wave 1 that was unusually higher than the long-term average. Despite two successful years, it is important to note that tobacco profits from Wave 2 and Wave 3 combined were still lower than tobacco losses in Wave 1.

It is also important to note that tobacco farmers bore significantly higher agricultural inputs than former tobacco farmers. Tobacco farming in general required more inputs than non-tobacco farming. Tobacco farmers also bore higher costs for household and hired labor because tobacco farming is a more labor-intensive activity. We also find evidence that child labor—both household and hired child labor—in tobacco farming persisted in Wave 3.

Evidence in the report suggests that shifting to non-tobacco crops may result in better livelihoods for many farmers. The government must identify and formulate comprehensive evidence-based policies to incentivize farmers to shift from tobacco farming. However, shifting away from tobacco is not straightforward. In fact, in some regions, tobacco may be the only viable cash crops during the dry season. Thus, the Government of Indonesia must identify conditions such that switching away from tobacco will be a viable option for current tobacco farmers. The findings do suggest that with support or reallocation of resources are likely to greatly engender economic opportunities outside of tobacco growing.

Recommendations

First, the government must identify and develop a reliable and adequate source of water and concomitant irrigation systems for non-tobacco farming in the dry season. Since the start of Joko Widodo's presidency, the government has been building water reservoirs. The government should continue to build strategic reservoirs or deep groundwater wells in tobacco regions and ensure the reliability of supply of water during the dry season.

Second, the government must establish agricultural extension services to educate farmers on different cash crops suitable for local conditions. The extension services should also introduce to farmers state of the art farming technology that would allow farmers to produce quality cash crops. The agricultural extension service should also provide market insights for farmers. For example, the extension service can provide information on crops that are in demand in local and adjacent markets. The extension service can also provide information on prices of different crops.

This information will help farmers to better decide crop portfolio in each season.

Third, the government must incentivize the establishment of farmer groups. The government can also provide start-up funds through available program such as the Village Fund program. Farmer groups facilitate knowledge sharing among member farmers. Member farmers can also pool resources to sell crops directly to market, eliminating middlemen in the process. Member farmers can also pool resources to obtain essential agricultural inputs, particularly fertilizers.

Fourth, the government can establish financial and non-financial incentives that are tied to non-tobacco crops growing. An alternative is for the government to initiate a credit program specifically to fund non-tobacco crops. Another alternative is to provide subsidized inputs conditional on the farmer's crop portfolio.



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Appendix A. Vignette Questions

The vignettes are hypothetical descriptions of people or situations that will be used to correct and adjust the self-reported subjective well-being (see Gary King's website <https://gking.harvard.edu/vign> for explanations and examples of this approach).

Self-rated Subjective Well-being Responses

During the interview, respondents were asked the standard question on subjective well-being that requires them to put themselves on a scale of 1 (poorest) to 6 (richest).

The question asked is as follows, and the respondents were also shown a show card with a picture of a 6-step ladder with 1 labeled poorest, and 6 richest.

SW01: Please imagine a six-step ladder where on the bottom (the first step), stand the poorest people, and on the highest step (the sixth step), stand the richest people. On which step are you today?

1 (Poorest) 2 3 4 5 6 (Richest)

The Vignettes

In the later part of the questionnaire, the vignette module is administered. There are 4 vignettes, depicting 4 different individuals and their consumption patterns on food, clothing, schooling, and their ownership assets. Again, the respondents were asked to put the person in the vignettes on a scale of 1 to 6. Since the same vignettes were being asked to respondents, their answers would serve as anchors on how they rate subjective well-being.

The vignettes are from [Ravallion, Himelein, Beegle](#) (2016) adapted to the Indonesian context. The vignette module was piloted and tested in tobacco farmer villages that were not part of the study sample, the vignettes are:

VG01 Family Sudarmo can only afford to eat chicken on very special occasions. They cannot afford for children to complete their junior high school because the children must work to help support the family. When the children are able to attend school, they must go in old clothing and worn shoes. The family does not own any farmland, only their household vegetable plot. Imagine a six-step ladder where on the bottom (the first step), stand the poorest people, and on the highest step (the sixth step), stand the richest people. Which steps do you think Pak Sudarmo's family is on?

1 (Poorest) 2 3 4 5 6 (Richest)

VG02 Family Sukidi can afford to eat chicken only once or twice a week. They cannot afford for all their children to complete junior high school. They generally wear simple clothing. In addition to their household vegetable plot, they own a small plot of poor quality farmland that is distant from their home. Imagine a six-step ladder where on the bottom (the first step), stand the poorest people, and on the highest step (the sixth step), stand the richest people. Which steps do you think Pak Sukidi's family is on?

1 (Poorest) 2 3 4 5 6 (Richest)

VG03 Family Mujiyo can afford to eat chicken every day. They can afford for all their children to complete junior high school their everyday clothing is simple, but they also have some fancy items for special occasions. In addition to their household vegetable plot, they have a larger plot of good quality farmland, not too distant from their home. Imagine a six-step ladder where on the bottom (the first step), stand the poorest people, and on the highest step (the sixth step), stand the richest people. Which steps do you think Pak Mujiyo's family is on?

1 (Poorest) 2 3 4 5 6 (Richest)

VG04 Family Partono can afford to eat whichever foods they would like, including eating out in restaurants. They can afford for all of their children to complete their education, and then to continue at a local university. They are able to afford a variety of batik clothes and also branded clothing. The family owns property, including a good car. The family also has a large farm and acts as landlord to others in their area. Imagine a six-step ladder where on the bottom (the first step), stand the poorest people, and on the highest step (the sixth step), stand the richest people. Which steps do you think Pak Partono's family is on?

1 (Poorest) 2 3 4 5 6 (Richest)

Vignette 1 was designed to depict the poorest HH, vignette 4 the richest. The order in which the vignettes were being asked to individual was random. The randomization was done by CAPI.

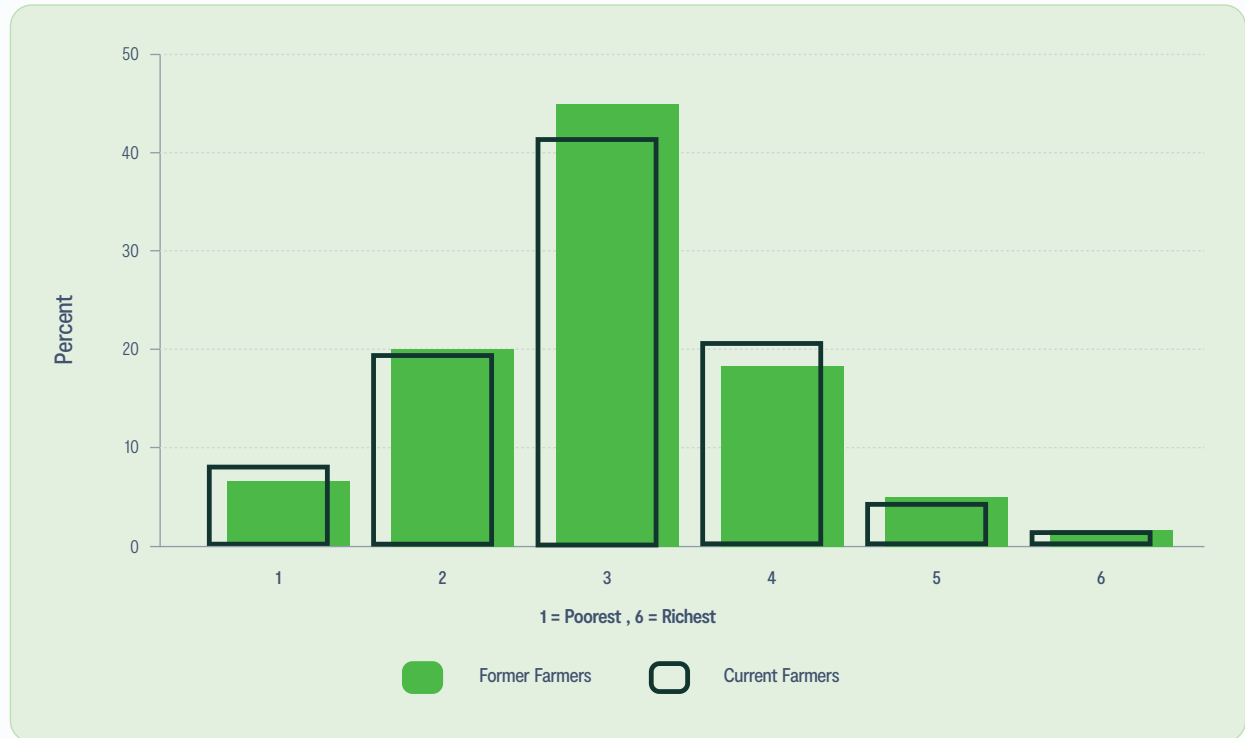
King, Gary, Christopher J. L. Murray, Joshua A. Salomon, and Ajay Tandon. 2004. "Enhancing the Validity and Cross-Cultural Comparability of Measurement in Survey Research." *American Political Science Review* 98 (1): 191–207. <https://doi.org/10.1017/S000305540400108X>.

Ravallion, Martin, Kristen Himelein, and Kathleen Beegle. 2016. "Can Subjective Questions on Economic Welfare Be Trusted?" *Economic Development and Cultural Change* 64 (4): 697–726.

Appendix B. Non-parametrically Rescaling the SWB Responses using Vignettes

Self-rated Subjective Well-being Responses

The following figure shows the raw responses of the self-rated subjective well-being of all respondents in Wave 3 (n= 655). The figure shows that almost 50% of respondents put themselves at scale 3, and that there's no difference in the distribution of the responses between current and former farmers.



Vignette Responses

Cleaning the Data

We first checked respondents' responses to see inconsistencies. The first panel shows the responses where each pair was ranked properly. The second panel in the table below shows the number of respondents who think that each pair of vignettes is at the same scale. These two groups would not pose a problem. The third panel shows the number of respondents who rank the poorer vignette to be richer than the richer vignette. We can see that the largest issue is between vignette 1 and 2 where 109 respondents think vignette 1 is richer. Instead of dropping these respondents and losing the observations, we decided to drop Vignette 1, so we end up with 3 vignettes to analyze.

Ranked Consistently				
	vg01	vg02	vg03	vg04
vg01		420	509	612
vg02			569	616
vg03				543

Tied				
	vg01	vg02	vg03	vg04
vg01		127	32	26
vg02			41	18
vg03				71

Ranked Consistently				
	vg01	vg02	vg03	vg04
vg01		109	35	18
vg02			46	22
vg03				42

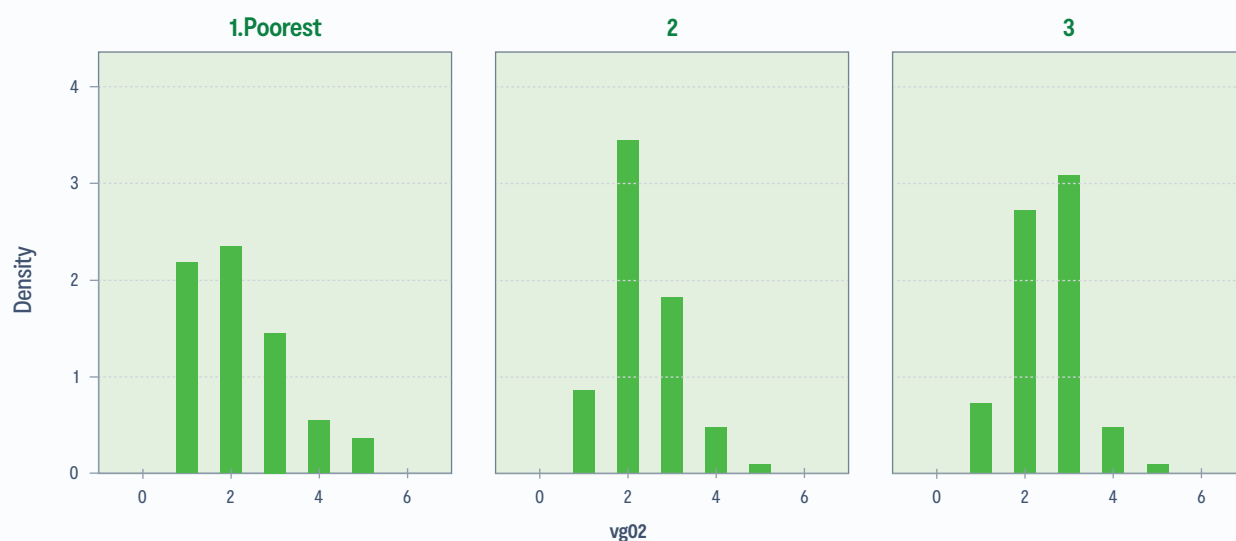
After dropping Vignette 1, we still need to drop cases where $vg02 > vg03$ OR $vg02 > vg04$, or $vg03 > vg04$. We end up dropping 86 respondents. We now end up with 570 observations to analyze. The table below shows the vignettes that were analyzed.

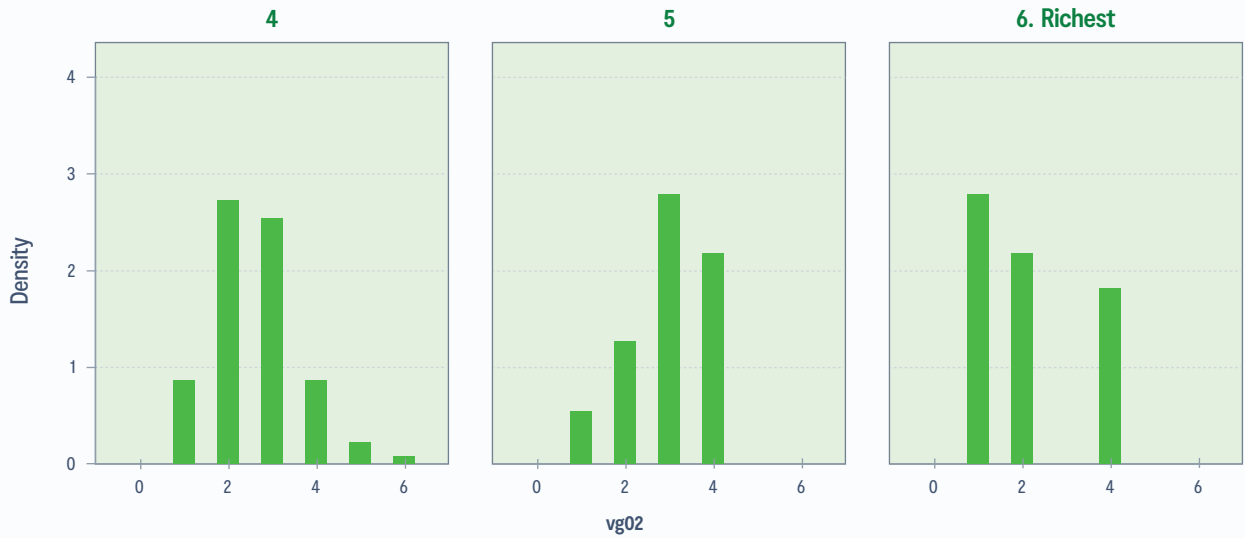
Tied		
	vg03	vg04
vg02	38	11
vg03		67

Ranked Consistently		
	vg03	vg04
vg02	532	559
vg03		503

Distribution of Vignette Responses

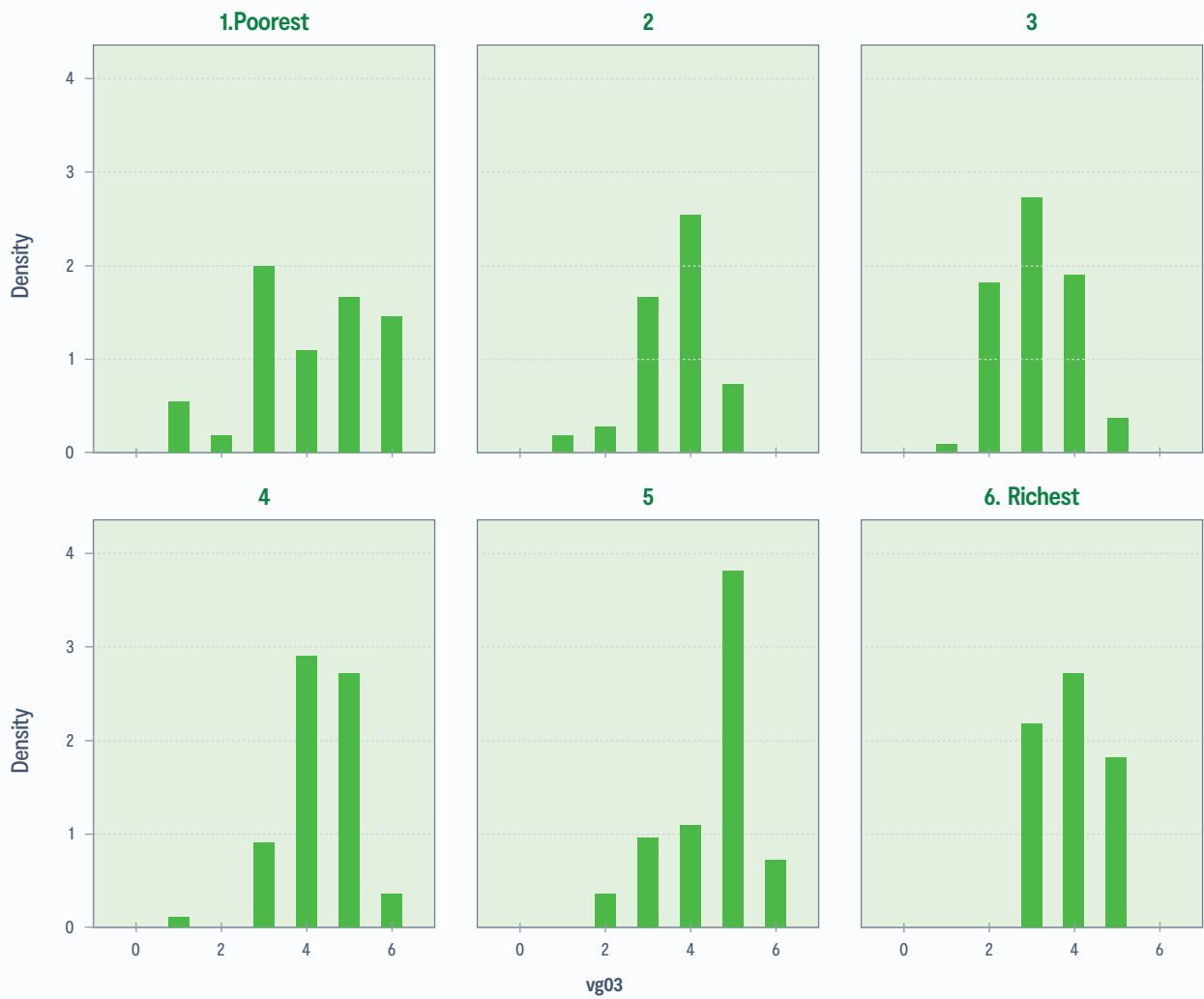
Figure below shows the distribution of how the vignette of a poor household (vg02) is perceived by respondents, grouped by their assessment of their own ranking. None among the two self-reported richest group give a scale higher than 4 for this household.





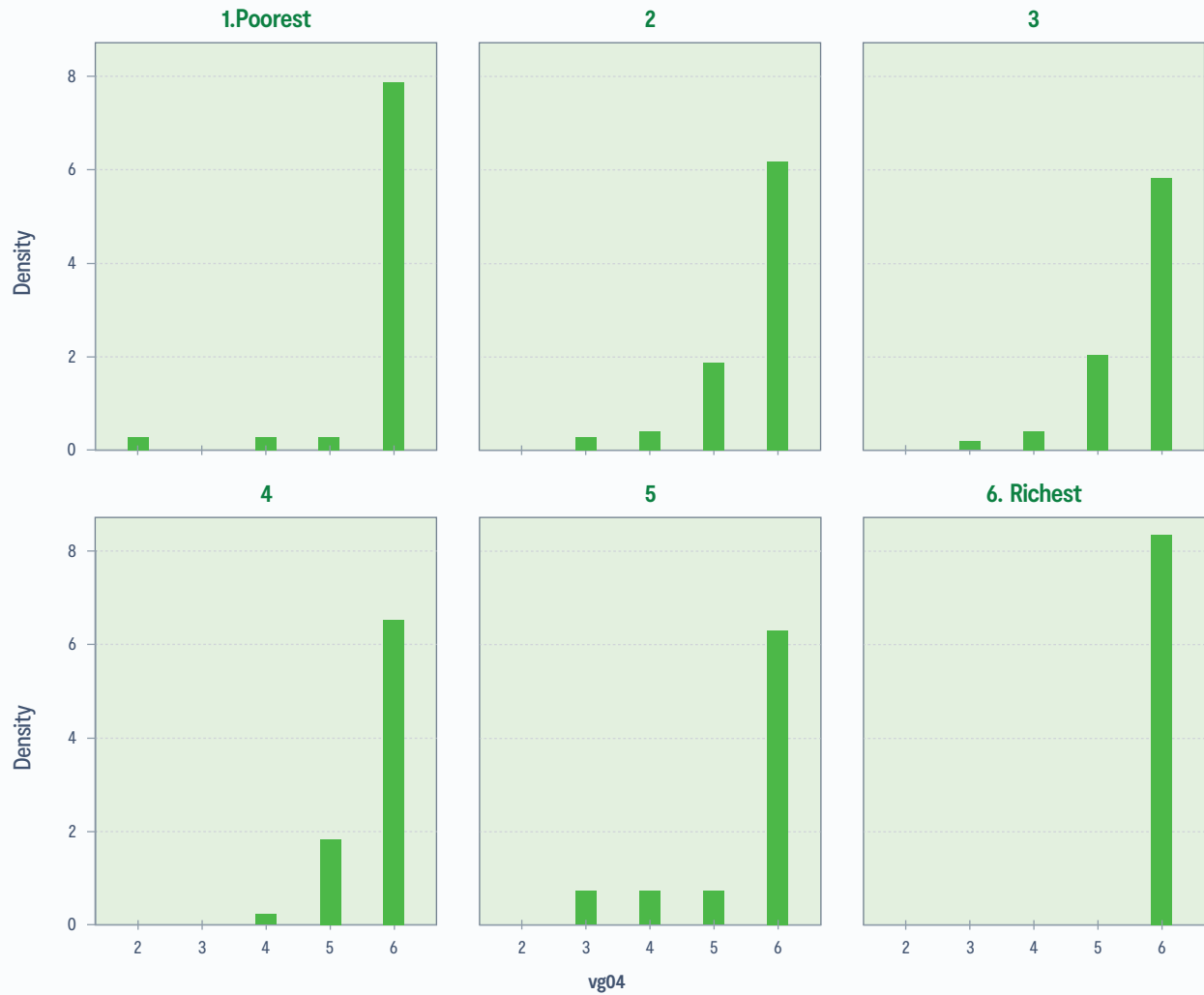
Note: Graphs b Please imagine a six-step ladder where on the bottom (the first step), stand the

Figure below shows the distribution of how the the vignette of a not-so-poor and not-so-rich household (vg02) is perceived by respondents, grouped by their assessment of their assessment of their own ranking. Noone in the self-reported richest group give a scale of 6 to this household.



Note: Graphs b Please imagine a six-step ladder where on the bottom (the first step), stand the

Finally, the figure below shows the distribution of how the vignette of a rich household (vg02) is perceived by respondents, grouped by their assessment of their own ranking. Most people in all group give a scale of 6 to this household, although significant fraction in group 2-4 give scale of 5.

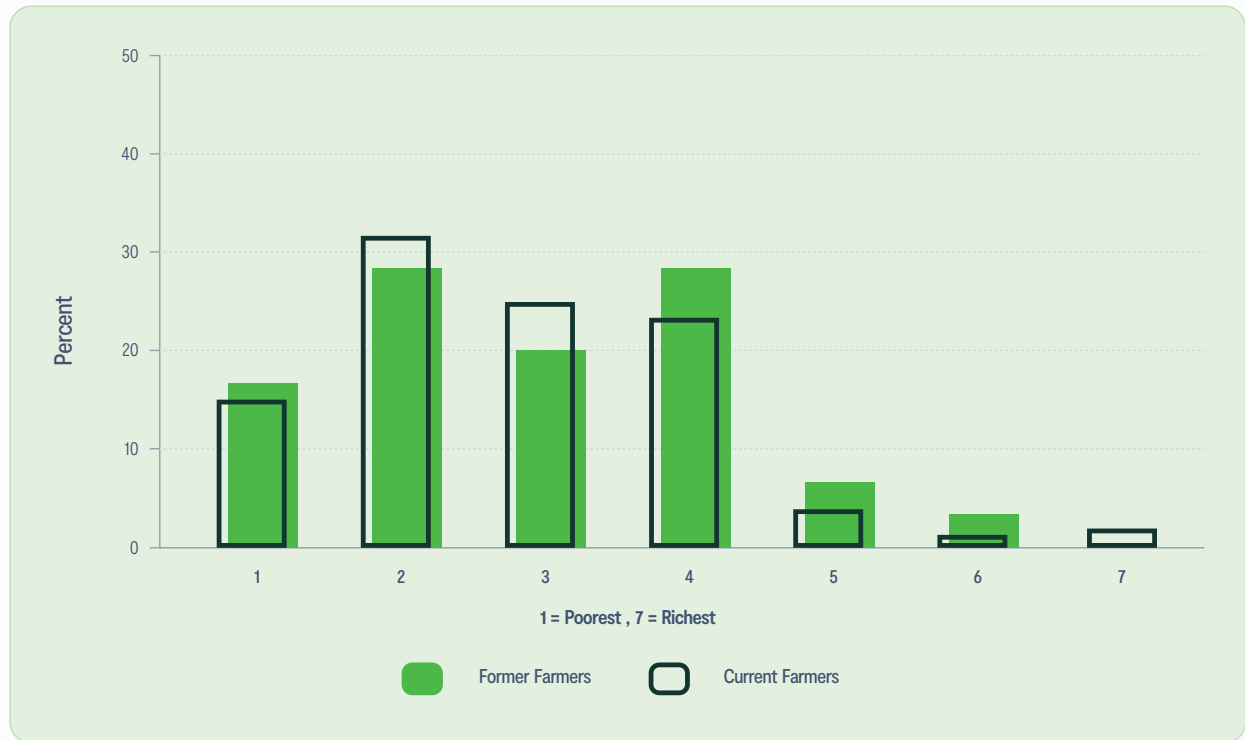


Non-parametrically Adjustment of Scales

We now make non-parametric adjustment the self-reported responses by using information we collect from the vignettes. To do this, following King and Wand (2007), we generated new ranks below. Note that we are not using vg01 in the analysis.

sw01 > vg04 > vg03 > vg02	Ordered	7	sw01 > vg04 > vg03 = vg02	Tied	7	vg04 > sw01 = vg03 = vg02	Tied	2, 3, 4
sw01 = vg04 > vg03 > vg02	Ordered	6	sw01 > vg04 = vg03 = vg02	Tied	7	vg04 = vg03 > sw01 > vg02	Tied	3
vg04 > sw01 > vg03 > vg02	Ordered	5	sw01 > vg04 = vg03 > vg02	Tied	7	vg04 = vg03 > sw01 = vg02	Tied	2
vg04 > sw01 = vg03 > vg02	Ordered	4	sw01 = vg04 > vg03 = vg02	Tied	6	vg04 = vg03 > vg02 > sw01	Tied	1
vg04 > vg03 > sw01 > vg02	Ordered	3	sw01 = vg04 = vg03 > vg02	Tied	3, 4, 5, 6	vg04 = vg03 = vg02 > sw01	Tied	1
vg04 > vg03 > sw01 = vg02	Ordered	2	sw01 = vg04 = vg03 = vg02	Tied	2, 3, 4, 5, 6	vg04 > vg03 = vg02 > sw01	Tied	1
vg04 > vg03 > vg02 > sw01	Ordered	1	vg04 > sw01 > vg03 = vg02	Tied	3, 4, 5			

The figure below shows the distribution of the self-reported subjective well being, adjusted using the vignettes. The figure shows some differences in the distribution of the adjusted responses, showing that larger proportion of former farmers are on step 4 or higher (36%) compared to current tobacco carters (28%).



Suggested citation:

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